COST OF LIGHT FROM THE ELECTRIC ARC.—BY ALTON D. ADAMS, C. E.
SEWER AIR; MISTAKEN IDEAS REGARDING IT.—BY LEONARD P. KINNICUTT, S. D.

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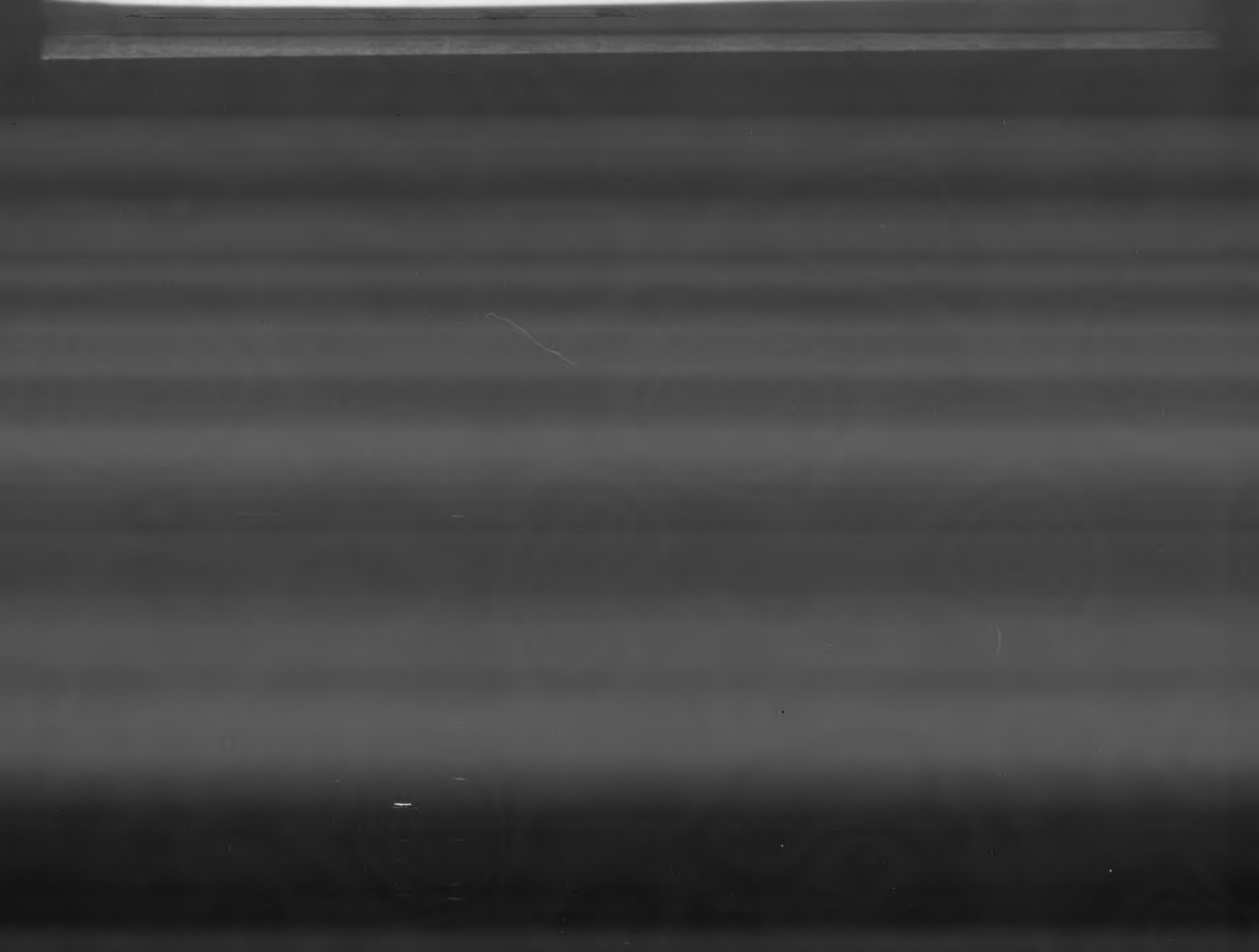

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COST OF LIGHT FROM THE ELECTRIC ARC.

By Alton D. Adams, C. E.

The electric arc lamp is in such general use for street lighting that its cost of operation is of public interest.

Whether a town or city is about to contract for street lighting or contemplates the erection of a municipal electric plant, a knowledge of the actual cost of operation is pertinent and may be a deciding factor.

As electric arcs for street lighting are usually charged for at so much per lamp, the bill of the electric company gives no clue to the actual outlay for operating expenses, and the usual information tendered to inquirers, that one horse power should be allowed at the station for each arc lamp is not sufficiently accurate to form the basis of any very close estimates. Electric energy for use in incandescent lamps and motors is quite commonly and properly sold by meter, so that the amount of energy consumed can be directly determined from the consumers' bill, and a little observation of the number and hours of lamps burned enables the cost per lamp hour for power to be readily figured. The cost of arc light aside from interest and depreciation on the value of the lamp, which is a very small matter, is made up of three items, labor for cleaning and trimming, renewals of carbons and globes, and the energy consumed at the lamp.

There are now two kinds of arc lamps in general use for street lighting, the open and the enclosed arcs, and it is important to note the distinction when considering the costs of operation.

The open type of lamps produces the light-giving arc between carbon points in the open air, the large globe commonly used not being closed at the top, and this lamp must be trimmed or have its carbons replaced every five or six hours burned. The enclosed arc is surrounded by a small, nearly air tight globe, inside the larger one and the light is produced in a mixture of gases quite different from the open air. The action of gases that surround the enclosed arc are to retard the destruction of the carbon rods with a result that new carbons are necessary for this lamp only once in about eighty hours.

Two long and two short carbon rods of fair grade to trim a double open arc lamp may be had at a cost of two cents, and the average labor cost of each trimming is about two cents, making the total cost of one trimming four cents and the cost

BIRD'S-EYE VIEW OF INDIANAPOLIS, LOOKING NORTH ON MERIDIAN STREET FROM TOP OF INDIANA SOLDIERS' MONUMENT

per hour burned for carbons and labor about thirty-six hundreths cent.

Carbons for the enclosed arc are more costly than those for the open type, and the value of these carbons for one trimming may be taken at three cents and the labor charge as before at two cents, making a total of five cents for each trimming.

As the enclosed arc burns about eighty hours with one set of carbons the cost of carbons and labor per lamp hour is about six hundreths of a cent per lamp hour. The small inner globes next to the enclosed arcs are broken by the heat after about five or six hundred hours and a charge of about four hundredths ths cent per lamp hour is ample to cover this breakage, bringing the total charge for carbons, labor and inner globes for the enclosed arc up to one tenth cent per lamp hour.

On the basis of eleven hours burning per day during a year of three hundred and sixty-five days, the saving in carbons and labor of the enclosed over the open arc will be (.0036—.001) (365x11) = $10.43 per lamp.

As this saving is in actual cost to the company operating the lamps, it should correspond to a difference of from $15.00 to $20.00 per lamp per year on the contract price, since no company can afford to furnish labor and materials at cost. At these prices the yearly cost of trimming are for the open arc lamp $14.45 and for the enclosed arc $4.02. Arc lamps are commonly rated at a nominal candle power quite different from the actual density of light given, so that a more satisfactory designation is that based on the actual power or watts expended in the lamps. The nominal candle powers of arc lamps used generally for street lighting are 2,000 and 1,200. The lamp rated at 2,000 candle power should consume about 480 watts and the lamp of 1,200 candle power about 330 watts, though lamps rated in nominal candle power only are not always kept up to these standards of power consumption.

As the rate of work represented by the watts is one-seven-hundred-and-forty-sixth part as great as the horse power, the nominal 2,000 candle power lamp with 480 watts consumes 480 divided by 746, equals .64 horse power, and the 1,200 candle power lamp with 330 watts consumes 330 divided by 746, equals .44 horse power. The cost per horse power hour in electric plants is subject to much variation, but with good equipment should not exceed one cent per brake horse power hour, where a fair grade of steam coal can be had for not more than three dollars per ton.

The series arc dynamo is the least efficient electric generator in regular use at this time, and its combined efficiency with the line for average cases may be fairly taken at 75 per cent. On this basis the 480 watt lamp requires .64 divided by 75, equals .85 horse power, and the 330 watt lamp .44 divided by 75, equals 59 horse power, so that the 480 watt lamp costs $.0085 and the 330 watt lamp costs $.0059 for power per lamp hour. The total charge per lamp hour for trimming and power will therefore be for the 480 watt lamp $.0121, and for the 330 watt lamp $.0095, on open arc lamps. On this basis the yearly charges for the operation of the 480 watt lamp becomes $48.57, and for the 330 watt lamps $38.13, subject to a deduction of $10.43, in each case provided the enclosed arc is used. It should be noted that these estimates do not include items of interest, depreciation and repairs on the electrical equipment,

BIRD'S-EYE VIEW OF INDIANAPOLIS, LOOKING SOUTHWEST FROM TOP OF MONUMENT

which are subject to considerable variation with local conditions. The contract price for 1,200 nominal candle power, or 330 watt arcs varies more than three hundred per cent., but in most cases is between two and six cents per lamp hour, a price of three cents per lamp hour being below the average for a large number of cities and towns in various states. It is interesting to compare this rate of three cents per lamp hour with the charges for electric energy sold through meter from constant pressure mains, and used in incandescent lamps, motors and commercial arc lamps.

On large yearly contracts involving the amounts of power commonly necessary for street lighting, electric energy can in many cases be had as low as four cents per thousand watts per hour and this rate could no doubt be frequently had for street lamps.

In the matter of actual energy consumed per lamp, arcs operated from standard constant pressure circuits, at pressures of 110 and 220 watts, are at a slight disadvantage, as the open arc under these conditions can use only about nine-tenths, and the enclosed arc about eight-tenths of the energy drawn from the line. The lamp requiring 330 watts, on the straight series system will therefore draw from constant pressure mains, if run with open arc, 330 divided by .9, equals 366 watts, and if with enclosed arc, 330 divided by .8, equals 412 watts. At four cents per thousand watts per hour the cast of energy for the open arc will be .336 times 4, equals 1.344 cents, and for the enclosed arc .412 times 4, equals 1.648 cents per hour; adding to these sums the charges per hour of operation for trimming, the charge for nominal 1,200 candle open arcs becomes 1.34 plus .36 equals 1.7 cents, and for enclosed arcs 1.65 plus .1 equals 1.75 cents per lamp hour. For a year's run of about 4,000 hours these prices correspond to nearly $70.00 per lamp year, which is much below the average price for arcs operated by the high tension series system.

It should be noted that while estimates given for cost to operate series arcs does not include interest, depreciation and repairs on the high tension machinery and system, the estimate for operation of arcs on the constant pressure mains is based on actual meter rates for electric energy and the cost of trimming, so that interest and depreciation are to be figured only on the lamp which usually costs less than twenty-five dollars at the start and has a low rate of depreciation. It should not be inferred from the above facts that central stations as a rule get more for high tension arc lamps than the conditions under which they operate warrant. The facts are that series arc systems involve a high first cost, a large depreciation and repair charge and a low efficiency of operation. These disadvantages arise from the necessary use of numerous small, inefficient generators, which can not be worked together on a single load, but each requires a separate distribution circuit. The conclusion to be drawn from above conditions is that a saving in the cost of arc lamp operation may be made by a change from the open to the enclosed arc and a still greater saving by the operation of arc lamps from constant pressure circuits as far as possible. These means of economical operation should be of interest to those in position to decide on electric street lighting, whether by contract with an existing company or the erection of a municipal plant. The constant pressure mains of present

BIRD'S-EYE VIEW OF INDIANAPOLIS, LOOKING NORTHWEST FROM TOP OF MONUMENT.

stations will often be found to cover a large part of the town or city area over which light is wanted, and there are means of extending such mains very cheaply where arc lamp service only is wanted.

Where a new station is to be erected with arc lamps for all or a part of the load there will in most cases be means of arc lamp operation from one or more large constant pressure generators, driven by economical engines and available at the same time for incandescent lamp and motor loads.

Hundreds and thousands of arc street lamps are already operated from constant pressure mains, and the time seems not far distant when the high tension, open arc, will be displaced for street lighting, as it has already been on interior lighting by the enclosed arc from constant pressure mains.

SEWER AIR; MISTAKEN IDEAS REGARDING IT.

By Leonard P. Kinnicutt, S. D.

A review of the popular literature and current opinion tends to lead to the belief that the air of sewers is a mysterious mixture of poisonous, gaseous products of decomposition, holding in suspension innumerable micro-organisms capable of producing all manner of disease, and that the sewer air exists under a pressure in the sewers that forces it up into the pipes that enter a house, and then through pinhole openings into the air we breathe. On the other hand, as I hope I may be able to point out, scientific experiment demonstrates the inaccuracy of these views on almost every point.

In the discussion of the question, I will first take up the chemical composition of sewer air; then speak of what is known regarding the micro-organisms that occur in the air, and, last, what danger there is of sewer gas finding its way from the sewers into houses.

During the past ten years, most careful and accurate examinations have been made by at least eight different chemists as to the substances to be found in the air of sewers. These examinations have been made, not in the air found in sewers of any one city, but on the air of sewers in various large cities—London, Paris, Munich—and the same conclusion has been reached by all investigators that from a chemical point of view it does not, except under very abnormal conditions, differ to any great extent from the outside air in the streets, and is no more impure, and often purer, than the air of dwelling-rooms.

In determining the purity of the air of a dwelling-room, we base our opinion on the amount of carbonic acid found—the gas which is given off from the lungs in the process of respiration—and upon the amount of ammonia the air contains; ammonia being the measure of organic matter derived from the breath, person and clothes. In the examination of sewer air, the investigator has been by no means content with merely the determination of these two factors, but has tried in all possible ways to obtain evidence that some poisonous gas is formed when animal and vegetable substances undergo decomposition under conditions similar to those

PEACE GROUP

On West Side Indiana State Soldiers' and Sailors' Monument

which exist in sewers. The only poisonous gas that has ever been detected is sulphide of hydrogen, and this, when it does occur, is found in so small an amount that it is doubtful if Hannemann, the founder of homeopathy, could conceive that it would have any direct effect on the human organism.

Experiments have also been made to see if by any possibility those comparatively little known and justly considered most poisonous substances, the ptomains, exist in the sewer air; but as yet, with the most careful work, not a trace of any such substance has been obtained. The result of all this chemical work can be summed up as follows:

There is no evidence that sewer air contains any poisonous gas or poisonous nitrogenous substance in an amount that could conceivably have any direct action on the various organs or tissues of the body.

That as regards the amount of carbonic acid and organic matter, sewer air contains very seldom more, and usually less, than the air of dwelling-rooms.

That there is nothing, so far as known, in the chemical composition of the air to account in any way for the popular conception that it is the cause of any disease.

That it is conceivable that it may contain some highly poisonous chemical substance of an alkaloidal or unknown character, in so small an amount that we are unable to detect it, but yet in sufficient amount to produce an effect on the general vitality.

When it was shown that the ascribed potency of sewer air for the production of disease could not be explained by its chemical composition, it was assumed that because sewage contained vast numbers of micro-organisms, twenty-nine million to one hundred and fifty million per liquid ounce, the air over the sewage must contain a very large number of these lowest forms of life; and, further, because among the one hundred and fifty million of these organisms there might be found certain bacteria which were known to be the cause of specific diseases, sewer air must also contain pathogenic germs.

Let us for a moment consider one or two facts concerning these microscopic forms of life. As far as regards the action upon them of mechanical force, they can be compared to fine dust. If the decomposing matter is perfectly dry, these micro-organisms, which are themselves the cause of the decomposition, will, like dust, be lifted up into the surrounding air by any and every current of air. But as soon as the current or motion of the air ceases, they will fall and be deposited on any solid surface. Thus the air of a room may contain on the average twenty to thirty to each cubic foot, but if the air of the room be set in motion by two or three persons passing rapidly through it, the micro-organisms which are on the walls, furniture, carpet, will be brought into the air and the number to the cubic foot may reach into the thousands. But in a very short time after the motion of the air ceases, they are again deposited on the walls, furniture, carpet, and the air contains the same number as before.

The rapidity with which they fall out of the air is shown by a long series of experiments made at Kensington Museum in England, where it was found that when a cubic foot of air contained ten organisms, 279 fell down from the air above and were deposited on each square surface of the ground per minute.

WAR GROUP

On East Side Indiana State Soldiers' and Sailors' Monument

If, on the other hand, the decomposing matter is not dry, but wet, as is the case in sewage, what takes place? Wet dust or mud does not leave the surface of the ground under ordinary circumstances. If a mudpuddle is violently agitated by stirring it with a stick, or by throwing a stone into it, small particles of wet dust are sent into the surrounding air, but fall again almost immediately to the ground; so if a liquid containing millions of micro-organisms remains quiet, these organisms remain in the liquid. If a liquid is put into such violent motion that it is converted into spray, the organisms are brought into the air, but they, like wet dust, fall back again almost immediately. In experiments where sewage has been converted into fine spray, it has been found that the micro-organisms have fallen to the ground within a distance of sixty yards from the place where they were sent into the air. If, as I have stated, these micro-organisms can be compared, as regards their movement in the air, to fine dust, it would seem as improbable that they could, by any agitation or movement that ordinarily takes place in sewers, leave the sewage and remain in the sewer air, as that wet dust or mud should be found floating in the atmosphere. Consequently, sewer air should be free from bacteria. Theory, however, is one thing, and facts another. What are the facts in the case? Numerous experiments have shown us that sewer air does contain micro-organisms, principally of two kinds—known as moulds and bacteria—but that the number per cubic foot is very small.

How can this be explained? Strange as it may at first appear, the explanation is that these germs come not from the sewage, but from the air of the streets.

This statement seems so improbable that it may be well to state a few of the facts upon which it is based.

First. The average number of micro-organisms in sewer air is less than in the air of the streets over the sewers. Twenty-five, for instance, in one cubic foot of sewer air, when there were forty-five in one cubic foot of the outside air.

Second. The number increases in the sewer air with the efficiency of ventilation. The more street air that enters the sewer, the greater the number of bacteria.

Third. The average proportion of the moulds to the bacteria in the sewer air is very nearly the same as it is in the air of the streets. If the micro-organisms had a different origin in the two cases, there is the smallest possible chance that the ratio between the moulds and the bacteria should remain the same.

Fourth. The state of foulness of a sewer has no effect in increasing the number of organisms in the air. Or, in other words, the same number are found in the air of the sewer when very dilute sewage, or rain water, passes through the sewer, as are found when the most decomposible matter is passing through it. This also seems impossible if the germs came from the sewage.

These facts are certainly very strong evidence in favor of the view that the organisms come from the outside air, and not from the sewage, and have done much to modify earlier views; so that the more conservative of those who are inclined to the belief in a causal relation between the air of sewers and pathological conditions are gradually coming to the opinion

WASHINGTON STREET, INDIANAPOLIS, LOOKING WEST FROM MERIDIAN

that this air is not directly concerned in the production of disease, but that its continuous respiration in some way interferes with the normal vital resistance of the tissues, and thus renders them more susceptible to infections to which they may be exposed. To sustain this view there is a certain amount of evidence, although direct experiment has not as yet given a positive answer. In the first place, sewer air may be considered as vitiated air. That is, though it does not contain any poisonous gas as far as we know, still it does contain a little less oxygen and a little more carbonic acid than pure air. The amount of oxygen in pure air is about twenty-one per cent. by volume. The air of sewers, from experiments made at Paris, may be considered as to contain on the average only about seventeen-and-a-half per cent. This is not a great difference, yet if one breathes continually such air, about nine-tenths of a pound less of oxygen would be taken into the lungs each day, and this, with the slight increase in the amount of carbonic acid (sewage air containing about two-tenths of one per cent. more than pure air), might possibly in time have effects which can not easily be foretold.

Secondly, we all know the effects of remaining a long time in a badly ventilated room. The slight headache, dizziness, and in certain cases nausea, we know do not come from the increase in the amount of carbonic acid in the room, for it has been shown by direct experiment that persons suffer no such symptoms from breathing for a number of hours consecutively pure air to which at least four times the amount of carbonic acid has been added than that found in the worst ventilated rooms. The exact cause of the symptoms experienced in badly ventilated rooms has never been discovered, though it is believed they are the effect of something, we know not what, given off with our breath. In the same way, there may be in sewer gas something, we know not yet what, which even in the most minute quantities, when continually taken into the system, lowers the general vitality. The few experiments that have been thus far made, are also rather in favor of this view, though, as I have stated, they are not at all conclusive. The most important are those of Alessi, an Italian; and Abbot, of the University of Pennsylvania. The former's observations led him to the belief that animals not normally open to infection by bacilli of typhoid fever became so after varying periods of exposure to the air of cesspools, and that the susceptibility was the highest during the first two weeks of exposure. After this period the animals seemed gradually to gain a tolerance, and seemed less susceptible to infection. This may explain the healthiness of men who work in sewers.

Abbott confined guinea pigs and rabbits in glass cages, so arranged that the only air they received was that which bubbled up through decomposing animal matter. His experiments do not seem to confirm the observations of Alessi, but did seem to indicate that the continuous breathing of this gas, and of this gas alone, for twenty-seven days, had a certain effect on the kidneys of the animals, all the other tissues and organs appearing perfectly normal; and even regarding the action on the kidneys, he felt that further observation on a new lot of animals would be necessary before a definite conclusion could be drawn. He concludes his

WASHINGTON STREET, INDIANAPOLIS, LOOKING EAST FROM MERIDIAN

article on his observations in the following words: "If the results of experiments made in this way upon animals are of any value in demonstrating the positive or negative effect of air saturated with gaseous products of decomposition, it does not seem reasonable, from these studies, to suppose the air of a sewer or cesspool, in the enormous dilutions that exist, when it reaches an individual in a house to which it has access can be of much importance in either the direct production of disease conditions or alone influencing the vital powers of resistance of the individual who inhales it."

I have tried, so far, to give to you the present state of knowledge regarding the composition and effect of sewer air; but allowing for a moment that the scientific view is all wrong, and that the very worst that has ever been claimed for sewer gas is true, I wish to consider for a moment the probability of the gas passing from the sewer into the air of dwelling rooms.

We are led to believe, through some of the teachings on this subject, that the air of sewers exists under a pressure, and that this pressure forces it into the houses connected with the sewer. A moment's consideration will show that this can hardly be the case. The large street sewer pipes are made of porous material, through which water can pass, as is shown by the fact that in laying a sewer through low, damp land, the land itself is drained and becomes dryer. Water being thus able to pass through these pipes, gases can easily do so, and consequently, only under exceptional circumstances can the air be under any pressure in the pipes.

Professor Chandler, in a lecture before the New York Trade School Plumbing Class, expresses himself on this point as follows: "The common idea that the gas in our sewers exerts a pressure to get out is a fallacy. I have yet to find a case to prove it. I some time ago had a lot of pressure gauges made which were distributed among the students with instructions to apply them wherever they could, but there has as yet been no case of pressure reported." A number of chemists have tried to obtain sewer air in their laboratories for purposes of experiment, by connecting a small pipe with the main sewer, thinking that then by merely turning a stopcock an unlimited supply of sewer air can be obtained.

Such is not the case, however. To obtain sewer air a pump must be attachod to the pipe and the sewer air be pumped out of the sewer. Currents of air, of course, exist in sewers, but these are more often away from the house than towards it. Thus, for instance, in a series of experiments made at Wimbledon, England, and contining for 358 days, it was found that on 273 days the air-current was away from the house; on 88 days towards the house; and on 97 days no current of air could be detected.

In the light of these facts, it is difficult to maintain that sewer air can pass from the main sewer into the small lateral branches, then through the soil pipes up to the still smaller pipes, and at last force its way out through the small pinholes left by the careless plumber. I do not deny that a certain amount of gas may come into a room through a faulty trap, or an open pipe, but this gas comes not from the street sewer, but from the decomposing matter in the pipes of the house.

To sum up the whole subject in a

few words, it seems to me that the danger from sewer gas has been greatly over-estimated; that there are no experiments showing that it contains any poisonous gas; that the few bacteria it does contain come not from the sewage, but from the air of the streets; that if it does ever contain pathogenic germs, these coming from the street air, would come more easily through the open window than through the drain-pipe; that possibly it may have an indirect action in lowering the general vitality, but that it is almost inconceivable how any amount of the sewer air could be forced from the main sewer into the air of dwelling-rooms.

In conclusion, I do not wish to be understood as advising a neglect of the laws of cleanliness, or as advocating the tolerance of bad plumbing; only as taking the position that sewer gas can not, on any scientific ground, be held to be the great criminal of the modern city house, and that possibly in its place we must put that which is usually considered harmless, illuminating gas.

THERESA AVE., OLIVE TO MORGAN STREETS, ST. LOUIS, PAVED WITH BUENA VISTA ASPHALT.

MACADAM FOR STREETS.

The relative values of thick and thin macadam and telford pavements are well brought out in a discussion of the subject of "Road Building" by the American Society of Civil Engineers, a report of which appears in the last semi-annual volume of transactions.

A fair conclusion to be drawn from the discussion is, that with heavy traffic the thick pavement is demanded, for the wear upon the surface is too rapid to allow for delays in repair of thin pavements, so that such pavements are liable to break through and be destroyed so

that reconstruction is necessary. With light traffic, one speaker claims that the wear will be less rapid on a thin pavement, because the elastic subgrade prevents the crushing of the stone in the wearing surface, which may occur if the foundation is hard and solid.

A thin pavement must be thoroughly packed and made watertight so that the subgrade will not be softened by rain, and the road bed must be thoroughly drained, otherwise the subgrade may give way under a load sufficiently to permit the breaking of the macadam layer, an accident which usually destroys the pavement at the point where it occurs and requires reconstruction. No macadam pavement, however, is properly built in which thorough drainage is not the first consideration. Every macadam street requires constant attention for repairs, and is most economical when kept in uniformly good condition.

Many figures of cost are given by those participating in the discussion, some of which will be given with such statements regarding conditions as are obtainable. In Massachusetts the state highway commission has constructed 223 miles of road, fifteen feet wide, with gravel shoulders three feet wide on each side, including grading, draining, special foundations when necessary, culverts, fencing, and all other expenses, at an average cost of $10,300 a mile. The thickness of gravel, or telford, or macadam, or whatever combination was used, is about twelve inches. Grading averaged $1,250 a mile and varied from zero to $15,000 a mile. The sides of the roads were finished out twenty-four to twenty-six feet wide.

In New Jersey thin roads have been built, the average cost varying from about $9,000 a mile, the first year of the action of the present law, to $4,000 a mile in 1898. Roads ten feet wide and eight inches deep have been built for $3,000 a mile. The average cost of road built in 1897 ranged from fifty to sixty cents a square yard. In the upper portions of the state, roads four and six inches deep are built at cost ranging from twenty to forty-five cents a square yard.

Queens county, much of which is now included in Greater New York, has many miles of macadam road eight inches thick in the center and six inches at the sides which are very durable and are kept in the best condition by a system which places a section of about twelve miles in charge of a foreman and two to four men who are constantly employed in repairing and cleaning up the roadway and looking after the drainage.

Still cheaper roads with only two or three inches of gravel or fine broken stone are described as constructed, without grading, for $800 to $1,700 a mile. These were for comparatively temporary purpose where the present traffic is very light.

In all these cases but the last, great emphasis is laid on the value of very thorough rolling, the time spent in rolling being usually about twenty to twenty-four hours for each one thousand square yards.

Much of the discussion can be applied to the streets in villages and small cities, except the business and main traveled streets, and to outlying districts in larger cities. The particular question for discussion is that of width of roadway. Many towns throw the whole width allowed for street, except narrow sidewalks and a row of trees, into the roadway, and improvement of the roadway by hard

pavements is delayed by the supposed necessity of paving the entire width, and the consequent prohibitive cost. Less than thirty feet is sufficient width for streets with light traffic, and the added width of lawns will materially improve the appearance of the street, as well as diminish the cost of the pavements. On very many streets the width of the gutters can be taken off the width of the street, and if properly graded, and the gradient of the street is low, the sod of the lawn can be run down into the gutter and out to meet the macadam. Where this is possible, it will be necessary to pave the gutter with stone or macadam whereever there is a probability of horses standing, *i. e.*, in front of entrances to houses, each side of hitching-posts, and the like. Streets with more traffic, and streets where much water gathers, or the slope is steep, will require more careful construction of gutters, and frequently one or two rows of flat stone in the bottom and some sort of gutter may be required.

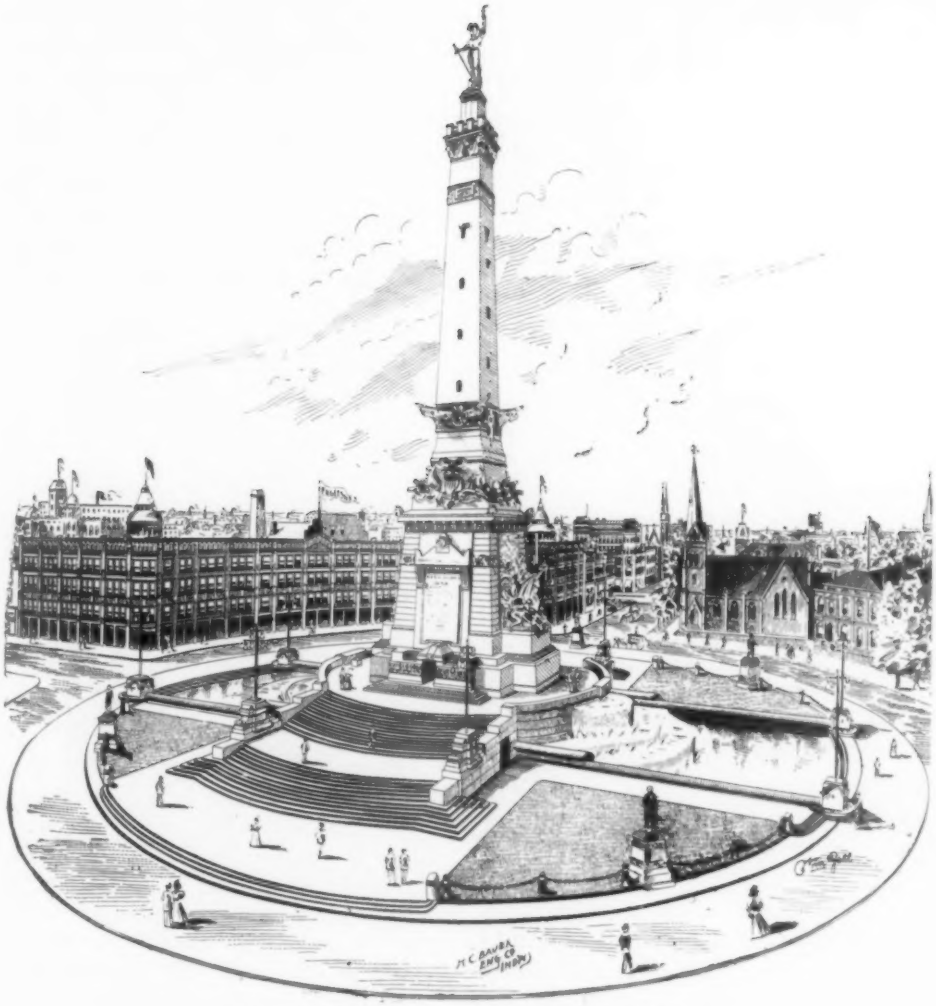
Indiana cities are in general well supplied with gravel or broken stone at reasonable prices and have done much to improve their streets in this way. Illinois is not so fortunate, and the supposed necessity of a twelve-inch macadam, or more, and of a forty- or fifty-foot pavement, combined with the relatively high cost of stone and good gravel, has delayed the improvement of many streets until the value of the property warrants a brick pavement. Experience with a few poorly constructed pavements, not properly cared for, has developed a prejudice against macadam, which it is hard to overcome by argument. If the experiment with tarred macadam which the city of Hamilton, Ontario, is trying is successful, this may be different enough to induce the trial of the new method. A twelve-inch pavement is laid for 76 cents a square yard, the first six inches being ordinary macadam or telford, the next four inches 2-inch stone tarred, and the top of three-fourth-inch of fine gravel or quarry screenings tarred. The stone is heated to dry it and the tar is added in the proportions of eight gallons to the cubic yard of the coarser stone and 10 to 12 gallons of the finer stone. Each layer is thoroughly rolled and a top dressing of screenings is then put on to be worked in by the traffic. Lightly traveled streets may reduce the thickness.

VITRIFIED CLAY PIPE INSTEAD OF IRON FOR GAS MAINS.*

By Irvin Butterworth, Manager of Columbus, Ohio, Gas Co.

The proposition that ordinary vitrified clay pipes, similar to those now commonly used for sewer construction, can be readily substituted, with great advantage and economy, for wrought and cast-iron pipe for gas mains, appears, if not when first presented, then upon due investigation, to be entirely correct. While its correctness can not as yet be proven by the citation of any examples of the successful use of vitrified pipes for gas mains, because such pipes have not as yet, to our

*From an address before Western Gas Association at meeting in Milwaukee in June, 1899.



INDIANA SOLDIERS' AND SAILORS' MONUMENT

DIMENSIONS: Diameter of Plaza surrounding Monument, 342 ft. 7 in.; diameter of Terrace, 110 ft.; height of Terrace, 11 ft.; Monument Foundation, 69x53 ft.; depth of Foundation, 30 ft.; height of Monument, including Foundation, 314 ft. 6 in.; height of Monument from street level to top of Statue, 284 ft 6 in.; height of Victory Statue, 38 ft.; Shaft at top, 13 ft. 3 in.; Balcony, 16 ft. The Balcony is 228½ ft. above the earth, to be reached by an electric elevator, or by stairway, consisting of 32 flights of 324 steps. On the east and west sides are colossal groups sculptured in stone, representing War and Peace, while upon subordinate pedestals, occupying positions on the plaza, are bronze statues of Gov. Morton, Gov. Whitcomb, Gen. William Henry Harrison, Gen. George Rogers Clark. On the east and west sides of Terrace there are large and magnificent cascades, and there is in the crypt a complete power, light and water plant exclusively for the monument. Architect, Bruno Schmitz, Berlin, Germany.

knowledge, been employed, even experimentally, for that purpose, yet the apparent objections to the proposed system disappear upon due consideration of the conditions to be met and the qualities of vitrified clay pipe.

The suitability of vitrified clay pipes for gas mains is due to its possession of the following properties:

1, Cheapness; 2, durability; 3, strength; 4, non-susceptibility to electrolytic action; 5, slight susceptibility to changes of temperature; 6, non-porosity; 7, adaptability to the making of service connections by the use of specials or a small auxiliary distributing pipe of wrought iron.

We will consider these properties in the order named, and in comparison with those of iron pipe.

1. *Cheapness.* — The following table shows the costs per foot of vitrified clay, cast-iron and wrought iron pipe at present market prices:

Inside Diameter.	Vitrified Clay.	Cast-Iron.	Wrought Iron.
4 inch	$0.04	$0.22	$0.35
6 "	0.06	0.35	0.65
8 "	0.09	0.46	0.98
10 "	0.13	0.62	1.50
12 "	0.17	0.81	1.92
15 "	0.25	1.19 (16 in.)	2.50
20 "	0.45	1.62	"
24 "	0.65	2.06	"

Vitrified clay pipes can be had, in quantity, in 4-foot lengths, and with large and strong sockets similar to the bowls of cast-iron gas pipe, at approximately the above prices. The 4-foot lengths would, however, necessitate the making of three times as many cement joints in a line of clay pipes as in a line of cast-iron pipes of the usual 12 foot lengths. The following is, therefore, a rough but fair comparison of the cost of a mile of 6-inch vitrified clay and cast-iron gas mains:

	Fire Clay.	Cast Iron.
Excavating and refilling trench, at 25 cents per foot	$1,320	$1,320
Cost of pipe in trench, at 6c. and 35c. per foot	317	1,848
Cost of making 1,320 and 440 cement joints, at 25c. each	330	110
Total cost	$1,967	$3,278

Saving in favor of vitrified clay pipes, $1,311, or 40 per cent.

For sizes of main larger than 6 inches, the saving would be still greater, being, for instance, in the case of a 12-inch main, more than 50 per cont.

2. *Durability.* — Vitrified clay pipes are even more durable than cast-iron. They do not rust or corrode. No chemicals or substances in the earth, foreign or otherwise, seem to attack them in the least. They are practically indestructible, and retain their strength and non-porosity indefinitely. I recently examined a piece of vitrified sewer-pipe that had been buried in the earth for 35 years, which, when cleaned, an experienced sewer-pipe manufacturer said he could not distinguish, by appearance or any other test, from freshly-made pipe.

3. *Strength.*—Vitrified clay pipe, while not as strong as cast-iron, is nevertheless amply strong for gas mains; as they do not break or crush when used for sewers, why should they do so when used for gas mains? The tensile strength of vitrified pipe, either fire-clay or shale, is astonishingly great. Edward Orton, Jr., professor of ceramics at the Ohio State University, recently made some careful determinations of the tensile strength of vitrified clay pipe. He found that ordinary single-strength, 6-inch, vitrified fire-clay sewer-pipes, with walls $\frac{5}{8}$ of an inch thick, withstood an in-

ternal hydraulic pressure of from 90 to 120 pounds per square inch; while 6-inch vitrified shale pipes withstood from 140 to 180 pounds, one piece not bursting even at the latter pressure. Twelve-inch, vitrified shale pipe, with walls 1¼ inches thick, have withstood an internal pressure of 220 pounds. A 2-foot length of 4-inch vitrified fire-clay pipe, selected at random, with walls ½ inch thick, was supported at both ends, and a weight of 2,800 pounds was suspended from the middle of the pipe before it broke. Vitrified clay pipe may be brittle, as are also cast-iron pipe, and like them can be easily broken by a sharp blow, such as they would never receive when in use as gas mains; but they are extremely strong, and do not readily break under a steady strain, such as they might be subjected to when buried in the earth. The difference between them and cast-iron pipe in this particular is not great, and the advantage is only slightly on the side of the cast-iron.

4. *Nonsusceptibility to Electrolytic Action.*—Vitrified clay pipes are not in the least degree liable to injury from electrolysis; whereas, as is well known, the electrolysis of iron pipes has become a most serious matter.

5. *Slight Susceptibility to Changes of Temperature.*—The relatively high co-efficient of expansion of iron constitutes a serious objection to the use of this material for gas mains. Iron mains frequently break, and their joints generally leak, on account of the excessive expansion and contrac ion of the pipe, due to changes of temperature. On the other hand, the expansion and contraction of vitrified clay pipes, buried to the usual depths of gas mains, would be very slight indeed, and in fact practically *nil*. The following is a table of the co-efficients of expansion of the materials named:

SOUTH MERIDIAN STREET, INDIANAPOLIS—WHOLESALE DISTRICT

Steel	.0000068
Cast-iron	.0000062
Glass	.0000039
Fire brick	.0000023
Common brick	.0000009

Although the co-efficient of ex-

pansion of vitrified clay has apparently never been determined, it is safe to assume that, inasmuch as it partakes more nearly of the nature of common brick than of glass, its co-efficient of expansion is no higher than the average of the co-efficients of these two materials, or say only one third that of cast-iron. Substantially this view is held by Prof. Orton.

The practical and economic advantage that vitrified clay gas mains would have over iron in this particular need not be dwelt upon here.

6. *Non-Porosity.*—Vitrified clay pipes are, except possibly at enormous pressures, absolutely impervious to gas, while cast-iron pipes are more or less porous at ordinary gas pressures. The vitrified clay pipes subjected by Prof. Orton to 180 pounds of internal hydraulic pressure showed no trace whatever of sweating.

7. *Adaptability to the Making of Service Connections by the Use of Specials, or by a Small Auxiliary Distributing Pipe of Wrought Iron.*—It is probable that a successful method of tapping vitrified clay mains for services, and of connecting the services to the mains, would soon be forthcoming; but in laying new mains, especially the smaller sizes, it would probably be best to place a tee special in the line in front of each building lot, with a small side opening, pointing upwards, to receive the service pipe when needed and to remain plugged until then. Such specials for 4-inch, 6-inch and 8-inch pipe would cost only about 18, 27 and 40 cents each, respectively, and larger sizes in proportion. They would not, therefore, appreciably increase the total cost of the main, and the slight increase would not exceed the cost of tapping an iron main for an equal number of services. But it may be found or considered preferable, for the larger sized mains particularly, to place such specials long distances apart, say at street intersections only, and connect them with a small, say 2-inch wrought iron pipe, placed a short distance and immediately above the clay pipe, and from which the various services would be taken.

All things considered, there really seems to be no reason why vitrified clay pipes can not be used, with satisfaction and great economy, for gas mains. There would appear to be no difficulty in making good, tight joints with cement, as the bowls can be made exactly like those of cast-iron gas pipe, with plenty of strength to withstand the caulking in of the jute or other packing. We all know of gas plants whose cast-iron mains are laid with cement joints that do not break nor leak beyond the normal rate; cement joints can surely be successfully used on pipe of similar shape to the iron, and that expands and contracts only one-third as much.

Of course the vitrified clay pipe must be selected and laid with care, but not more carefully, as it seems to me, than cast-iron pipe, which is almost as nearly non-elastic, and which needs a firm and solid bearing throughout its entire length. The bottom of the trench should be scooped out to conform to the shape of the clay pipe, the earth should be thoroughly tamped around it, and a thin plank should be preferably laid over it to protect it from puncture by picks, etc. Lay the vitrified pipe as carefully as you lay the cast-iron, and the breakage due to settlements will be no greater, while that due to expansion and contraction will be less, as will also be the leakage. It may be found best also to use "ring" pipe with-

out sockets, and employ a pantaclinal, pitch, or other flexible joint. In any event, possibilities for the reduction of the construction accounts of gas companies by the use of vitrified clay pipes instead of iron for gas mains seem too great and promising to be despised.

MUNCIPAL OWNERSHIP OF WATER-WORKS.

By John B. Heim, Supt. City Water Works, Madison, Wis.

It has been demonstrated that water-works plants can be conducted successfully for the benefit of the public, but it all depends upon the management. The objection raised against muncipal ownership has been politics, and justly so. If politics enter into the management, it means continuous change in heads of departments, with natural consequences of the changes in the subordinates. Under such conditions, the plant becomes expensive, the interest in success is lost. The only interest taken is to lay plans to remain in office, the sinecure being the uppermost thought. No well regulated and successful establishment changes its manager annually or semi-annually. It would bring chaos and ultimate failure. There certainly is no difference in the case of a municipality that makes these annual and semi-annual changes, with the exception of a larger pocket-book to rely upon, the taxpayers being obliged to continuously meet the obligations.

I could name you cities that at one time stood foremost amongst the water-works plants of these United States, which now, on account of politics, rank third, fourth and less. Where the tendency of a city is to purchase the works from a private company, or to construct and own its water-works plant, the first course to pursue is to pass ordinances and rules by which the management is placed under a board of water commissioners, to take full charge of the plant, the mayor to be an ex-officio member of the board, and the common council to have a member ex-officio to represent its body. This would keep the works more or less free from politics, with less liability in the change of the management.

As an illustration, I will give you our results at Madison, Wisconsin. In May, 1881, a private water company asked for a franchise for the term of twenty years. They offered to lay eleven and a half miles of mains; ten hydrants to the mile; the hydrant rental to be for the first one hundred hydrants at $82.50 each; after the first one hundred, $50 for each additional hydrant, purchasable in five, ten and twenty years, by giving notice one year in advance; price to be fixed by a commission of three disinterested parties with six per cent. added. Their estimate price of construction was given at $126,000. Our charter limit on the assessed valuation was $81,000. We had the sum of $19,000 in the sinking fund, which was made available by an act of the legislature.

This company, finding that there might not be such easy sailing, withdrew, making room for another company that called for a franchise. The common council investigated all matters in connection with such a large undertaking, and came to the conclusion that it would

be a good investment for the city, and that the city should reap the benefit—that the city could construct a plant just as well, and as cheap as a private company; that in twenty years every dollar of indebtedness could be paid; and that the city would build according to the money available; adding as the demands required and according to the amount of money at command.

constructed well is shown by the repairs. The cost of repairs amounted to only $7,350.70 in sixteen years. With the permission that the city could use the $19,000 available in the sinking fund, the city was only required to borrow $76,000 at 5 per cent. This indebtedness has gradually decreased down to $8,000, and would have been wiped out several years ago,

BATTLE CREEK, MICHIGAN, WATER WORKS.

Comparative Pumping Record, Showing the Extravagant Waste of City Water in Neighboring Cities.

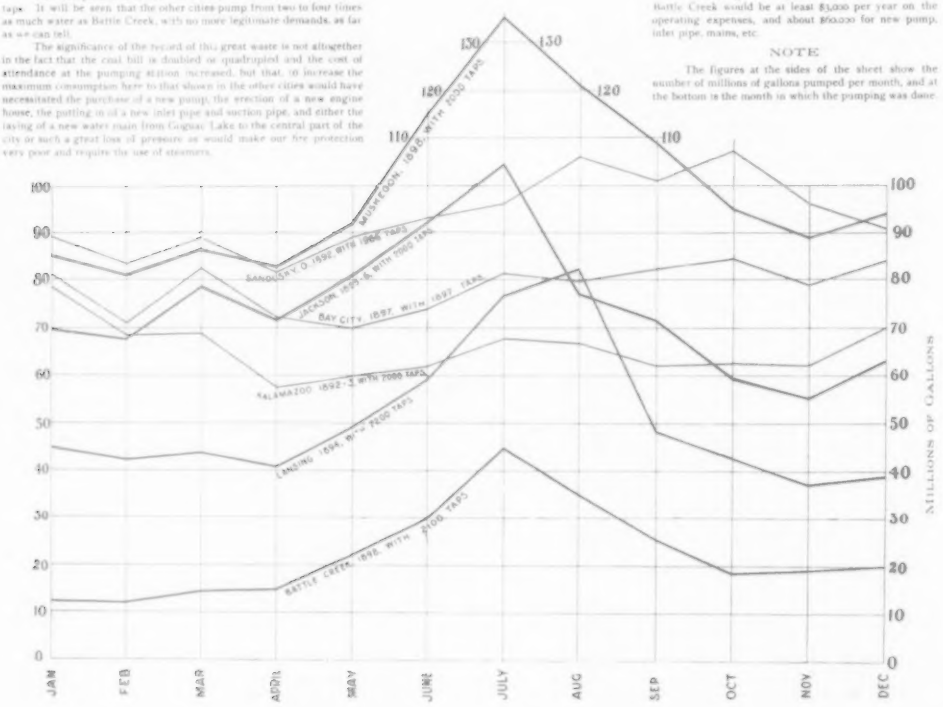
This comparison is made when the cities named had about 2,000 taps. It will be seen that the other cities pump from two to four times as much water as Battle Creek, with no more legitimate demands, as far as we can tell.

The significance of the record of this great waste is not altogether in the fact that the coal bill is doubled or quadrupled and the cost of attendance at the pumping station increased, but that, to increase the maximum consumption here to that shown in the other cities would have necessitated the purchase of a new pump, the erection of a new engine house, the putting in of a new inlet pipe and suction pipe, and either the laying of a new water main from Goguac Lake to the central part of the city or such a great loss of pressure as would make our fire protection very poor and require the use of steamers.

The saving made by the restriction of waste in Battle Creek would be at least $3,000 per year on the operating expenses, and about $60,000 for new pump, inlet pipe, mains, etc.

NOTE

The figures at the sides of the sheet show the number of millions of gallons pumped per month, and at the bottom is the month in which the pumping was done.



The cost of construction, with one mile more of mains, two artesian wells, instead of a lake connection, and building and grounds for a pumping station, was $31,000 less than the estimated cost given by the private company, which proved that the city required no administrator to conduct the work for it.

That the works must have been

had not the water department come to the rescue of the general and school fund. But in twenty years the original indebtedness will be wiped out as agreed.

The total cost of construction at the end of the sixteenth year, September 30, 1898, was $326,893.27. This includes ten artesian wells, which cost $37,241.82. A lake connection, I estimate, would not

have cost over $10,000; thirteen miles of lead service pipes laid free to the curb at a cost of $35,762.80; 2,269 water meters, free to the takers, including the connecting of the meters free, the first two years of the adoption of the general meter system at a cost of $40,165.43; an electric light plant for the pumping station at a cost of $587.10, and two new boilers at a cost of $3,675. Deducting the first three items, which a company rarely furnishes, would mean our construction cost only $223,723.82. Our total receipts from water rents and permits were $240,800.70; cost of operation, which is always more by a city than by a private company, $149,464.61, giving our city net receipts of $91,336.09. This amount was turned over to the construction fund, and brings with it a lower water rent than by a private company, and the construction item is reduced to $132,387.73. Had our city allowed a private company to construct and own the water-works, the city would have paid under the franchise and agreement for hydrant rental the past sixteen years, $246.225, which, with five per cent. added, $12,721.95, would have amounted to a sum total of $258,946.95, with no water rents to collect or other resources at command to cover this amount. We would have had no free water, with the exception of 18,000,000 gallons per year, under the franchise for churches, schools, public buildings and fountains, whereas, we furnished last year, as near as we can estimate by the counters at the pumps, including the above mentioned 18,000,000 gallons, 128,164,000 gallons for street sprinkling, water motors in churches and schools, sewer flush tanks, flushing of sewers, gutters, etc. If we deduct the $132,387.73 as the construction item from the hydrant rental of $246,225, not considering the five per cent., it shows a gain of $113,837.77 in favor of the city, aside from the city being the owner of the plant, with a continuous gain for the city from year to year. On the other hand, the city would be minus $246,225, and an increase of the same from year to year. The hydrant rental in 1882–83, would have been $10,000, and in 1897–98, $19,750. The present year, with only small extensions contemplated, it would amount to $19,900, whereas, our construction and extensions cost us in 1897–98 only $8,966.69, and will be about the same the present year.

The city would be owner of nothing, obliged to pay for everything not strictly mentioned in the franchise, unable to unload this increasing perpetual burden, and our citizens would have to pay a considerably higher water rent.

The question may be raised that the hydrant rental is larger than cities pay as a rule. The usual rate of all plants, built at that time (1882), was $100 and over for the first one hundred hydrants, on account of high-priced material in construction. Cast-iron pipe, when we constructed, was, by competition, $44 per ton. Should we calculate even at an average hydrant rental of only $45 a hydrant, our city would still be the gainer, with a yearly increase.

Our results became known. Of over two hundred cities that changed from private to municipal ownership within the last ten years, not considering the new plants by the municipalities, a great many cities and villages followed in our footsteps, and adopted our methods, if we can judge from our correspondence, the information we gave, and their

results afterwards given us. Our advice is that cities should own their water-works, but, as I stated in the beginning, only when they can be placed on a business basis, the same as in a private plant.

The main essential for success is pure water. Wherever it is possible, avoid rivers and lakes for the supply. Some of the states are rich in water-bearing rock, filled with pure water. Most everywhere a successful artesian well can be drilled. It should be drilled below the drift, and down to granite or traprock, and of not less than ten inch bore in diameter.

Where it can be done, our advice would be the direct pressure system. Valves should be placed so that no more than the length of a street along two blocks or squares will be cut off, to inconvenience as few takers as possible, in case of repairs.

You do not require ten hydrants to the mile, as a private company does, placing them for the rental. Instead of 323 hydrants, which would have been the number with us under the private company's franchise (ten hydrants to the mile), we have only 161 hydrants, sufficient for all purposes. Lead pipe services are the best and cheapest in the end. The water meter system is the only true way to sell water; it saves fuel, pumping, machinery, and secures a good supply of water.

In 1886-7 with 980 takers, and no water meters, we pumped on an average of 715,885 gallons of water per day. Last year with 2,473 water takers and 2,269 meters, we pumped on an average of 750,730 gallons of water per day, only 34,845 gallons more, with 1,493 more takers.

The water meters should be embodied in the construction specifications as part of the plant. It is easiest and meets with the least objection to adopt the general meter system at the outset.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

STREET SIGNS AND HOUSE NUMBERING.

One of the first moves of our new administration will be naming streets and numbering buildings for use in free mail delivery to which we are entitled, and we would like some information as to methods and cost. *F. Shutts,*
City Engineer, Lake Charles, La.

The easiest and cheapest way to put up names of streets is to paint the names on boards and fasten these boards to the sides of houses. The boards should be braced by tongues and grooves across the grain to prevent warping. Gilt letters on a sanded black surface make signs of satisfactory appearance and durability which are not very expensive, costing perhaps thirty or forty cents each in quantities, or less if names are short. Enameled signs were popular for a time, but, especially where there are frequent changes of temperature, the differences in expansion between enamel and backs finally destroy the lettering, if the stones from the hands of the small boys do not. Letters of aluminum and other materials may look well, but fall off one by one and thus deface the signs. Cast-iron or other metal signs usually rust or discolor too soon. The more expensive signs seem to be also the more expensive to keep in condi-

tion. The only way to estimate the cost for the city is to count the corners requiring signs, and estimate the length of words and the additional cost of posts where houses are not located on corners. Post signs are not usually as durable as signs attached to buildings and the character of such signs depends on the manner of lighting the streets. These remarks are intended to apply to small cities. If iron plates are used for gutter crossings the names of streets can be cast on them in raised letters at slight expense. Where cement walks are laid, brass letters can be imbedded in the top coat and will be very conspicuous and attractive.

House numbers should be large enough to be readily seen. The minimum size, say two and one-half inches in height, should be prescribed by ordinance, numbers being made of the usual proportions, say two and one-half inches for each figure and the space between figures. When a wholesale numbering or renumbering is undertaken, it is customary for the city to pay the bill or to furnish the numbers at the low cost possible on contract for large amounts, giving property-owners the privilege of furnishing their own numbers within prescribed limits of size, style and legibility. In such case the city probably furnishes the cheapest number possible, a gilt or silver figure on a black background on reasonably good tin, costing perhaps 8 to 15 cents for one to three figures in a number. The property-owner is notified by general publication or by particular notice of the number belonging to his residence, and if it is not put up at a certain time the city lets the contract for putting up the numbers for the delinquents and pays the bill or assesses it on the property as ordinance prescribes. Single numbers of aluminum, china, enamel, etc., may be used but are ordinarily more expensive. Numbers painted on transoms are legible if the transom is not concealed by porch or vines. Omaha, Cincinnati and Indianapolis have good ordinances for house numbering.

PEACHTREE STREET, THE PRINCIPAL RESIDENCE STREET OF ATLANTA, GA. ASPHALT PAVEMENT LAID IN 1892.

The popular method of numbering is to begin at a central street and number each way or at the water street, allowing one hundred numbers to a square or block, so that the number will always give the number of blocks from the starting point. If the city is not regularly laid out it may be well to assume a fixed length of street for a hundred numbers, say 500 feet or 528 feet. These blocks or artificial squares may be laid down on the map, and if each street, no matter what its starting point, is numbered accordingly, the location will be determined with ease by strangers in the city. Diagonals should be numbered in the same way, taking the number running in the usual direction with which it makes the least angle. Begin at the starting point with 0 and not with 100 as in Omaha, Bloomington, Ill., and a few other places. Where subdivisions of lots, new buildings, or stairways requiring numbers are not probable, a number to each platted lot may be sufficient, though, for example, 524 may be on one corner and 600 is the next number, but it is more satisfactory to divide the space into a larger number of divisions, giving the door the number of the division in which it stands. Thus with the 500-foot squares suggested above each ten feet would be entitled to a number, and a house on a thirty-foot lot would receive one of the three numbers, belonging to the lot, depending on the location of the doorway. It is usual, however, to put the number, as 600 above, on the first corner of the block with other numbers in 600 instead of the last number in the block of 500.

THE PREVENTION OF ELECTROLYSIS.

As in many other cities, our water pipes are having a sharp touch of electrolysis. About a year ago, the Detroit, Ypsilantic and Ann Arbor Electric Railroad was built through a portion of Congress street, and crosses the Huron river on an iron bridge. From the west end of the bridge, the ground rises about 40 feet in 300 and is moist clay. East of the river for about 2,000 feet is a nearly level gravel drift. The ground then rises about 35 feet in 500, and is also moist clay. In this clay the service pipes are mostly damaged, where they pass under the north rail—the power-house being on the east bank of the river, and north of the track. The electrician of the road advises a connection between the rail and main pipe to save the service. Penny-wise and pound-foolish, is it not?

C. S. Woodard, C. E., Ypsilanti, Mich.

A paper by Harold C. Brown, and the accompanying discussion on the same, appeared in the report of the Fifth Annual Convention of the American Society of Municipal Improvements for 1898. It gives the general opinion of the city officials who are experts upon this question. It is to the effect that the electric railway companies are required by law and equity to protect the water and gas pipes, and that the only safe way in which to do this is to resort to some method of returning the current to the power-house, which will keep it from wandering to the pipes. The double trolley system is recommended as the most feasible way of doing this. Mr. Brown proposes that the current through the pipes be broken by inserting sections of non-conductor, such as wooden stave pipe. He would connect the sections of iron pipe, between the insulating sections of wooden pipe, with a station where the electric condition of the pipe can be tested readily and frequently, and break up the sections still more if the first trial is not sufficient. The trouble mentioned in the question seems to be the greatest where the conductivity of the soil is greatest, a condition for which Mr. Brown's suggestion is particularly made. Connection be-

tween dynamo and main pipe is sometimes resorted to, but is seldom even reasonably satisfactory, especially when the soil is a more than usually good conductor. This is on account of the difficulty of making a good connection of wire with pipe and of too small conductivity of wire. Whatever the railroad company may do to protect the pipe, the water-works should arrange for frequent easy tests of the electric condition of the pipe. This is easily done in this case, for the trouble seems to be confined to one or two points.

COMMENT ON CURRENT TOPICS.

Water Meters as Waste Preventers. One objection to the general introduction of water meters on private house connections has been in the fear that the water meters in ordinary use were not mechanically so perfect that they would register the slight flow that would result from small leaks, so that the meters would not afford the desired check upon defective plumbing, especially after the meter had been subject to some wear. A number of experiments have been made upon this line in recent years which have removed much of this doubt. Mr. E. Kuichling, of Rochester, N. Y., presents the results of some of his examinations, which show that with very few exceptions small meters will measure within about ten per cent. A flow of from nine to forty gallons an hour of clean water, in three or four cases the percentage of error is eleven to nineteen and in one case it is twenty-nine. In three cases defects in the workmanship caused meters to refuse to register less than fifteen, twenty-five and forty-one gallons an hour, respectively. The meters had been in service from ten to sixteen years, except about five, which had been in use from one to four years. Mr. John W. Hill has made tests on new meters, and comparative tests at different periods during tests lasting several months, which show that with but one exception the meters tested would register a flow of about five gallons an hour, with less than fifteen per cent. of error. These results demonstrate the possibilities of the small meter as a waste detector. Mr. Hill's paper and the discussion may be found in the Transactions of the American Society of Civil Engineers, Volume XLI.

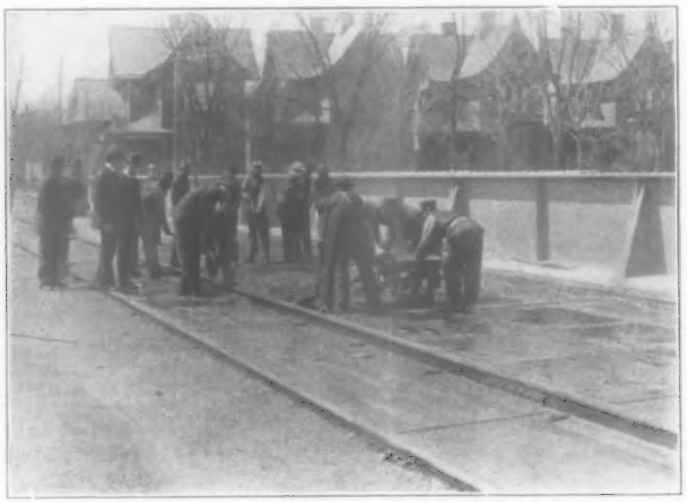
With this doubt of the accuracy of the measurement of small flow removed, the next question presenting itself for discussion is that of the economy of adopting the meter system.

Practical questions of local conditions must enter. It is a fact that in small systems the amount of water to be pumped has been decreased materially, thus reducing the cost of maintaining the works and increasing the net revenue from the system while, at the same time, the cost to water-takers

has been reduced much more than the cost of meters. Whether this will be true in any particular case can be estimated in advance after a careful study of the local conditions. Enough examples are now to be found to show that the probabilities are very much in favor of a saving to both water system and water users.

A comparison between the cost of furnishing the amount of water estimated to be wasted and the interest on cost of meters, repair, replacing, and extra cost of accounting will frequently determine the economy of the meter system without further search. In all cases there will come a time when the limit of capacity of the system is nearly reached, and the additional cost of procuring new machinery, putting in larger mains and obtaining a new supply must be considered. Meters on all services may reduce the waste so much that such enlargements of the system are postponed for several years.

A standard argument for metering all services, which is always correct, is the equalizing of the payments for water service by requiring each consumer to pay for his own benefits. Without meters the citizen who uses water legitimately must pay, perhaps, ten times the proper amount to make up for the wanton waste of others. Actual examples of this can be cited in large numbers.



LAYING ASPHALT SURFACE ON BITUMINOUS CONCRETE ON FERRY STREET BRIDGE, BINGHAMTON, N .Y.

City Maps.

The city engineer of Danville, Ill., Mr. Charles Cottingham, has prepared a series of maps for his city, showing the public improvements, the plan of which is so good that it may well be followed by other cities of similar size. An accurate map of

the city was prepared on a scale of 300 feet to the inch. From this map a tracing was made whence prints with black lines on a white ground were obtained.

On one of these prints are laid down the lines of sanitary sewers, showing location, depth, grade, size, manholes, flush-tanks, inspection tubes, and tees. Another shows the same data for storm sewers. Another shows the curbing, giving grade, elevation at each change of grade, direction of flow in gutter, drainage areas and width between curbs. Another shows the pavements, all brick, where and by whom excavations have been made, with tables showing make of brick used, method and date of construction and cost per square yard. Another gives the information about sidewalks. Another gives the house numbers allotted and used. Another shows location and size of water mains and fire hydrants.

Copies of these maps mounted on cloth on spring rollers, in dust-proof case under lock, are in the city engineer's office, mayor's office, and can be provided for other offices if necessary. Copies of the last map mentioned are furnished to each fire engine or hose house.

The maps are small enough to be handled conveniently and show the information clearly, much more so than if the attempt were made to put all the information on one map, even on a much larger scale.

Other maps that may be required are those of the electric, gas or vapor lights; parks and their connecting boulevards; telegraph lines, especially if in conduits; telephone lines, except the individual distribution; lines of surface drainage, which should be on a contour map; trees, if the street lawns are in charge of city officials.

Such maps as these, so far as the improvements are carried, can be made very useful for cities of smaller size also. Cities much larger than Danville will require more detailed plans of pavements, sewers, sidewalks, house numbering and perhaps of water mains, but maps on small enough scale to be convenient to handle can be used to give the most general information and to serve as indexes to the sheets containing the details.

American Society Civil Engineers' Convention.

In point of numbers the recent convention of the American Society of Civil Engineers was most successful, bringing together the largest number of members and visitors ever collected at an engineers' meeting in this country. About twice as many were present as attended the Detroit meeting last year, and for the inconvenience there complained of, that members were so scattered that it was impossible many times for friends to get together, was substituted that of insufficient accommodations, which threatened for a time to destroy the pleasure of the convention. And the last state was worse than the first.

The society follows at this convention a new method of providing

material for the technical sessions of the convention, similar to that suggested in the report of the Detroit meeting in these columns last year. Tuesday's afternoon session was given to the discussion of two questions in methods of computation of bridge strains, which were proposed in advance, that members might make all desired preparation to take part in the program. Some members were secured in advance to give certainty to the discussion, and others joined, so that the argument lasted through a long session. Wednesday there was a similar discussion, of questions on pollution of streams, purification of sewage and water supply, and the vexed problem of the co-efficient of friction in riveted steel pipe, for which there was still more careful preparation, and in which there was much interest. On Friday, the questions were on economy of transportation by electric power and by the telferage system. Account of these discussions will be given later. Thursday was spent in excursions to points of interest about Philadelphia.

The usual scattering vote on the questions of the time and place of holding the next convention was taken and the decisions were left to the board of directors. It is safe to say that a less popular place will be chosen, or larger preparations will be made for possible attendance. The high-water mark reached this year is very gratifying, and can be reached frequently if the management always learns from experience as readily as in the past. The fresh and timely character of the discussions warrants a continuation of the plan of the programmes presented, though more short, well prepared written discussions of the questions may be desired. These are usually hard to obtain, for the members are usually busy people and indications are visible that their business is increasing, but persistent effort will bring some papers, and the meetings will be more satisfactory without many such papers, or without any, than was usually the case under the old system of two or three heavy papers taken with no reference to timeliness or to the convention requirements.

The illustrated lecture on the construction of the Delaware breakwater, given on Tuesday evening, must not be forgotten. It added much to the value of the meeting.

Standard Forms of Municipal Reports.

The Committee on Municipal Data of the A. S. M. I. presented a report at the Washington meeting, giving a series of forms for water-works, paving and sewerage reports of municipalities, which was printed in the last annual report of the society, and which will come before the convention at Toronto in October for action. Members of the society can see the report in the volume of proceedings. Copies of the forms can be secured by any one who is interested by sending to the chairman of the committee, Charles C. Brown, Bloomington, Ill. It is

desirable that the best possible forms be presented for final action by the society, and the committee needs all the assistance it can get in criticism of the forms already submitted and in additions thereto. Forms for lighting, street cleaning, garbage disposal and other municipal public work reports are desired, and the committee will be thankful if experts in these lines will submit forms. The matter is one which is of interest to all public works officials and city engineers, and the committee solicits correspondence from all interested persons and will send the forms thus far prepared to all who desire them.

Manufacture and Testing of Cast-Iron Pipes.

A paper on this subject by Thomas H. Wiggin before the Boston Society of Civil Engineers gives many interesting details, which are not readily obtainable elsewhere, of the methods of manufacture of cast-iron pipe and the reasons for defects of various sorts. There is also considerable discussion of the methods of testing pipes and pipe materials, and of the methods and results of various methods of coating cast-iron pipes. There is nothing really new in the paper, but it gives in one collection much data of practice gathered from actual observation and experience in the foundries by an engineer posted in the excellent specifications of the metropolitan water board of Massachusetts. It is for these reasons of sufficient convenience and value to warrant calling special attention to it, that those interested may know where to find it. It will be found in the transactions of the society as published in the *Journal of the Association of Engineering Societies* for May, 1899.

The Front-Foot Rule in Making Assessments for Improvements.

The decision of Judge Phillips, of the United States District Court, in the case of *Fay et al.* v. *City of Springfield, Mo.*, continues to be a subject of interested discussion, on account of its possible far-reaching importance in affecting assessments on the front-foot method for street improvements. It is especially significant in connection with the ruling in the United States supreme court, in the case of *Baker* v. *The Village of Norwood, Ohio.*

An abstract of the decision of Judge Phillips was given in the July number of MUNICIPAL ENGINEERING. There are some distinct features of the case under the Missouri statutes, but it brings the front-foot rule of assessment under very close examination wherever it prevails, and if the broad question raised by Judge Phillips is finally upheld, it will cause serious disturbance of present methods of providing for payment of street paving.

The Missouri statute (sections 1495 and 1496, R. S. 1889) authorizes the apportionment of the costs of paving according to the front foot, without regard to the question of fact whether or not the given parcel of land is benefited thereby

to the extent of the assessment, and without affording the property-owner an opportunity to question the existence of such benefit. The fact that no such opportunity is provided for is, in the opinion of Judge Phillips, in contravention of the fourteenth amendment to the federal constitution and is therefore void.

The decision in full is quite long, but the substance of it is clearly set forth in the syllabus by the court, in the last issue of the *Federal Reporter*, as follows: "The only theory of law under which the cost of street improvements can be imposed as a special tax on the abutting property, rather than as a burden upon the entire municipal community, being the fact that the local property is peculiarly benefited thereby, statutes or ordinances which arbitrarily assume that such local property is benefited in the proportion of the frontage thereof are invalid, unless the opportunity is afforded, at some period in the progress of assessment and the enforcement thereof, to be heard upon the question of fact as to whether or not the benefit is equal to the burden imposed. And as the supreme court of the state holds that, notwithstanding no notice or hearing is provided therefor when the tax is imposed by the city council, the owner, when sued for the enforcement of the special tax, can not be heard to defend upon the ground that his property was not in fact benefited, nor upon the question as to whether the apportionment of the costs is equal among the several lot-owners. The statute is violative of the fourteenth amendment of the federal constitution and the whole tax may be enjoined."

In states where the front-foot rule of assessment is followed, but the issuance of bonds in payment for the improvement is based on a special contract with the property-owner, whereby he waives all legal questions regarding methods or errors, the decision will not, it is believed, have serious effect, as the waiver is a contract which eliminates all other legal questions. Still, this question has not yet been ruled upon in any court, so far as known to us. A final legal determination of all questions involved in the Springfield and Norwood cases is of great importance, and there is good reason for the belief that when the questions reach the federal supreme court the tangle of doubtful points will be straightened and simplified without the serious results now apprehended by many.

CURRENT INFORMATION.

Utilization of Garbage Crematory Heat for Electric Lighting.

At a meeting of the Municipal and County Engineers, A. H. Campbell, Assoc. M. Inst. C. E., city engineer and surveyor of Canterbury, presented a paper reviewing some of the English attempts to utilize the heat from garbage crematories or refuse destructors for producing electric light current. He described a combined refuse destructor and lighting plant now under construction for Canterbury, and stated that the leading principles which governed the design of the plant were as follows:

(1) Exclusion from the engine and dynamo rooms of all dust from the refuse.
(2) The dust destructor must work either alone or in combination with the electric plant.
(3) Sufficient furnace capacity to burn the day's refuse in ten hours, between noon and 10 p. m.
(4) Provision of accumulators for storing current generated in the afternoon.

The destructor consists of two cells, which are guaranteed by the builders to burn 14 long tons of refuse in twelve hours, under forced draft, to a hard, innocuous clinker; also to evaporate by the destructor gases alone 2,800 lbs. of water per hour at 60 degrees Fahrenheit., at an assumed pressure of 126 lbs. per sq. in., being at the rate of 1 lb. of steam produced and 1 lb. of refuse consumed in 10 hours, the balance of time being allowed for getting up steam. As the destructors were not yet in use, no results from this combined plant could be given. Mr. Campbell reviewed, also, three combined plants which have been burning refuse and generating electric current on a large scale for some time. He said that Lord Kelvin and Prof. Barr recently reported that the Oldham destructor consumed 7.96 long tons of refuse per cell, leaving 32.9 per cent. of the original unscreened mass as ashes and clinkers; the boiler pressure was 128 lbs. and the evaporation per pound of refuse ranged from 0.88 to 1.33 lbs. Although no definite figures regarding the Shoveditch plant were given, an opinion was quoted that 1 lb. of refuse then evaporates 1 lb. of water. Statements from Borough Engineer Stephenson regarding the Llandudno plant leaves 30.5 per cent. of clinker and evaporates 1.4 lbs. of water to each pound of refuse. The total estimated amount of refuse destroyed by this plant in one year was 5,800 long tons, of which 310 tons were fish offal and green grocers' refuse, the balance being domestic wastes. The amount of refuse burned per sq. ft. of grate surface per hour was 71.7 lbs., and each pair of cells had 50 sq. ft. of grate surface. Mr. Campbell cited, beside these three plants, 13 towns at present pledged to the construction of such joint works, one of which was Canterbury.

Refuse Disposal in Towns.

In a recent communication to Mayor Brown of Mansfield, O., Snow & Barbour, sanitary engineers of Boston, submitted recommendations for disposing of garbage and sewage as follows:

The proper and efficient disposal of the sewage and garbage of any city constitutes one of the most important problems in municipal affairs, and the time is rapidly arriving when it will no longer be deemed possible to dispose of the sewage by flowing it into some nearby stream or of the garbage by dumping it in some out of the way place or feeding it to swine. The tendency in the disposal of both classes of waste is to follow nature's methods, utilizing during the process of destruction such opportunities of obtaining an income as the method of disposal may present.

Garbage, distinctively, usually means the organic wastes of the city, such as kitchen offal, bodies of animals, condemned foods, market refuse and other putresable matters. In the light of its disposal it is often well to consider in connection with the garbage the other refuse of the community, such as the combustible waste and the ashes.

It is well known that all these waste matters can be disposed of by burning. For years this method has been employed on account of its efficiency and virtue from a sanitary standpoint.

There is another process by which certain marketable products are obtained from one class of the daily waste, namely—the animal and vegetable garbage. It does not deal with the organic waste or refuse, which amounts in some cases to 20 per cent. of the whole, nor yet with the night soil or bodies of animals, except in a limited way. This process is, therefore, limited to the disposal of about 20 per cent. of the total bulk of the waste material produced by a municipality, and to be economical is necessarily limited in application to cities of considerable size. The argument in favor of this utilization process is in the value of the product extracted from the waste.

The burning process, on the other hand, is from a sanitary standpoint final and complete; the garbage is absolutely destroyed or rather reduced to mineral forms in the shape of clinker, which can be utilized for several purposes

Within the past few years it has been proved that the heat generated by the consumption of the garbage is capable of being utilized in the form of steam power, and the value of this power, especially where an installation for the disposal of the garbage can be combined with the production of power for sewage disposal, electric lighting, and other municipal necessities, is greater than that of the by-products obtained by any other method of utilization of the garbage.

Undoubtedly the time is rapidly approaching when the solution of the garbage and sewage disposal problem will be recognized as so corelated that the two will be inevitably taken up together whenever this is possible.

It is perfectly practicable to consume the wastes of towns and cities in properly constructed furnaces, and to apply the product of combustion for steam power. This has not been done in this country because engineers have had but little information as to the details of the furnaces, the amount of power obtainable from a given amount of waste, and for the reason that up to within a few years there was no furnace operated in this way. The question has, however, been solved abroad, and many places are at present destroying their unsorted wastes and supplying the whole or a greater part of the heat for generating steam power which is utilized in pumping sewage, for electric lighting and for trolley roads.

To indicate more definitely the use of re-

fuse destructors the following places are instanced:

Bath—Population 52,000; 240 tons of waste are destroyed weekly, the waste heat is used in grinding clinker, which with cement is made into curb stones, channel blocks, etc.

Winchester—Population 29,000; 100 tons of waste burned per week; destructor located in pumping outfall; waste heat utilized in pumping sewage to farm three-quarters of a mile away.

Leyton—Population 90,000; 195 tons of town refuse and 135 tons of pressed sewage sludge are destroyed weekly; waste heat passed through boilers, steam being used for operation of sewage pumps; one-half pound of water evaporated for each pound of mixed refuse burned.

Cambridge—Population 36,983; waste heat is utilized for pumping sewage to farm two miles away; two engines of eighty horse power each are used; 140 tons of waste destroyed weekly.

Loughborough—Population 20,000; eighty tons of refuse burned per week; waste heat used for pumping sewage; three centrifugal pumps, lifting sewage twenty-five feet, also power for lighting small electric plant supplied.

Bradford—Population 230,000; waste heat is utilized and an evaporation of .725 pounds of water per pound of refuse burned is obtained, giving as a result eighty-one horse power per hour per ton of refuse burned.

Rochdale—Population 73,000; heat utilized and 1.64 pounds of water evaporated for each pound of refuse burned.

In Boston at the present time 250 cubic yards of combustible refuse are daily disposed of by a destructor which, after 90 per cent. of the entire amount is removed by sorting for marketable purposes, burns the remaining 10 per cent. and produces steam for running the machinery of the sorting apparatus, electric lights for the building, and in doing this only utilizes one-fourth of the power possible to obtain.

For the purpose of destroying a mixed collection of general refuse and ashes, bodies of animals, etc., a furnace of particular form is necessary; one that will consume everything without any fuel, and at the same time be entirely sanitary and inoffensive in operation and will develop the largest amount of power to be had from the refractory material destroyed. Such a furnace can be designed at no great expense, especially if an installation in combination with the pumping station can be arranged, which will successfully carry out the above requisites, and this is the only method which we would recommend to you for consideration. It will, without question, absolutely solve your problem of garbage disposal, and the disposal of other waste. In how far it can be utilized toward the production of the necessary power for pumping the sewage depends upon local conditions, of which sufficient data is not at hand to make a definite statement possible.

The question of the amount and quality of the garbage produced must be studied for each community before definite estimates can be given. From a general standpoint it may be predicted that a city of twenty thousand people will produce from five to eight tons of kitchen garbage, from one to three tons of miscellaneous combined refuse, and from one to six tons, varying with the season of the year, of ashes. There will also be the bodies of animals, beside yard sweepings, factory or trade refuse, etc., the whole amounting to perhaps twelve to fifteen tons daily of mixed waste. With a destructor of the type which we have in mind the whole of this waste can be destroyed without other fire than that produced by the waste itself, and one horse power per hour can be developed from each thirty pounds of waste consumed. Therefore, if fifteen tons of waste matter is obtained daily, it will be seen that one hundred horse power for ten hours will be obtainable, an amount probably greatly in excess of that necessary for pumping of sewage, and therefore suggesting the utilization of the surplus for the production of light for the pumping station and other municipal uses.

Recent tests by well-known engineers have shown the possibility of evaporating from one to one and one-half pounds of water for each pound of waste burned. Lord Kelvin, in a report of a test of an English furnace, writes as follows: "With such town refuse as is treated at Oldham we consider it should be easy to obtain a steam product equivalent to an evaporation of one and one-third pounds of water from and at 212 degrees F., per pound of mixed refuse treated."

In a report by Sir Douglas Fox of a trial of the furnace at Leyton, already mentioned, an evaporation of 0.567 pounds of water for each pound of refuse burned is stated as the result obtained. Assuming an average of ten pounds of water evaporated for each one pound of coal consumed, it will be seen that English town waste has a fuel value of about one-seventh of that of good steam coal. These statements immediately bring home its possible value as a coal-saving device, in utilizing it for the production of power. * * *

As already stated, this production of power by destruction assumes the collection and burning of the entire waste of the town. The method of collection is an important factor. If collected by the individual system a much lower quantity will result than if some more responsible and manageable method is used. Where men are designated or licensed to charge a fee to the householder individuals neglect their premises to such an extent as to sensibly limit the daily quantity of garbage collected. The yearly contract system, by competition, often results in a loss to the contractor, unless he can slight his work, which he manages to do in spite of the sanitary police. By far the most garbage is collected where the city owns its own scavenger department. The cost will, in general, be higher than by the contract system, sometimes running as much as 50 per cent. in excess of contract prices. The estimate of the amount of daily refuse to be disposed of under the poorer system and under the best system, both for a part of the city and for the whole sanitary district or districts, can best be made after consultation with the health officials and the city engineer. Upon the amount of garbage and other wastes would depend the possibility of economical installation in connection with the sewage disposal.

Sprinkling Oil on Roads.

The experiment of sprinkling roads with oil has proven so successful in Los Angeles county, California, that A. E. Davis, chairman of the county board of supervisors, is preparing to sprinkle several miles of road. The manner of sprinkling is as follows: A tank about 6 ft. long, running on two wheels which are attached to the rear of an oil tank wagon, is filled with oil by means of a hose and is then discharged through tubes 6 inches apart below the tank, which are operated by a lever. Only a sufficient amount is run through the pipes to take up the dust. The oil is run into little furrows made by a little hoe and is covered by other hoes attached to the machine. This is to prevent it from seeking a level in any low

ground and becoming unevenly distributed. After all the oil has been applied the same machine is used to incorporate the oil and the earth.

The department of parks of the city of Boston has been experimenting with sprinkling the driveways with crude oil to lay the dust. J. A. Pettigrew, superintendent of the department, sprinkled a section of one of the parkways, about 800 ft. long and 40 ft. wide, using the oil at the rate of 0.6 gallons per lin. ft. The roadway was hard and smooth, and the effect of the oil seemed to be a slight disintegration of the surface or loosening of the bond of the macadam. The small stones thus loosened were soon crushed into powder, and formed a layer on the surface which is now at least ¼ in. thick, sufficiently permeated with oil to prevent it from being blown by any but strong winds. During a period of two months on that part of the roadway subjected to dust the treatment has resulted in the abatement of the dust. One disadvantage of the use of oil for park work is its rank odor. The experiment was not considered so fruitful of good results as to induce the department to continue it. There is no question, however, but that it will effectually lay the dust. Mr. Pettigrew suggests that on a hard, macadam road it would be a good plan to spread a cushion of loamy sand to receive the oil in order to prevent the disintegration of the surface of the macadam.

Municipal Improvement Contracts in Cuba.

An opinion has been written by Attorney-General Griggs, Washington, D. C., regarding the construction of a system of sewers and the paving of the streets of Havana, Cuba, by a contract with Michael Dady & Co., pursuant to the provisions of the old Spanish law. He says:

"Cuba is now under the temporary dominion of the United States, which is exercising there, under the law of belligerent right, all the powers of municipal government. In the exercise of these powers, the proper authorities of the United States may change or modify either the form or the constituents of the municipal establishments; may, in place of the system and regulations that formerly prevailed, substitute new and different ones.

"Upon this line the same authorities, exercising sovereignty over the island, have the power to provide the methods, terms, and conditions under which municipal improvements, which relate entirely to property belonging to the municipality or held by it for public use, may be carried on. The old provisions of the Spanish law may be adopted, so far as is practicable, or they may be entirely dispensed with and a new system set in their place. The municipal authorities of Havana, in the matter of engaging in the construction of public works, may be permitted to proceed under such law as is now applicable, if that be adequate, or they may, at the will of the military commander, be restricted from engaging in any such works, or from permitting any such works to be carried on, although inchoate or even completed contracts therefor have previously been entered into."

He is unable to definitely state, however, whether Dady & Co. have any rights under the proceedings of the authorities in Havana relating to the matter of constructing works according to plans prepared by said corporation and alleged to have been adopted by the municipality.

Attorney-General Griggs has also given an opinion in which he holds, in effect, that the Havana street railway franchise, known as the Torre concession, on the evidence submitted, is superior to all others, and is such as entitles its owners to be permitted, at their own risk, under the permission of the municipal authorities, to proceed with the work of construction without the injunction of the military authorities. He says: "This will not interfere with an adjudication in the courts of the ultimate and final rights of the parties."

Right of Water Company to Enforce Rules.

An opinion was handed down July 17 by Judge Gunster in the suit of Margaret Smith vs. the Scranton Gas and Water company. Application was made by Cornelius Smith several years ago for water for several properties. No notice was given to Margaret Smith, later, that the property had been transferred to her by Mr. Smith, nor did the water company have any knowledge of the transfer. Consequently, the company sent her no bills and made no demand on her personally, but continued to charge the water rents to Cornelius Smith. Demands for payment were made upon him several times, until the amount had accumulated into a large sum. Finally, during last June, the water company called Mr. Smith's attention to the amount of the water rents due, and asked him to kindly remit within ten days. Upon his paying no attention to this the water company proceeded to take steps to shut off the water, when Mrs. Smith came into court and showed that she owned the property, and that if the company were permitted to cut off the water from her properties it would impose on the tenants who occupy them a hardship and wrong that would greatly endanger their comfort and health, and would impose irreparable injury upon the plaintiff. The judge finds that there is no doubt of this, and clearly shows by reference to Supreme court cases in Pennsylvania, the propriety of the company's enacting reasonable rules and regulations and enforcing them, and decides that, under the facts in this case, the plaintiff has no standing in a court of equity.

Risk in Dealing with Public Officials.

The supreme court of Georgia has rendered a decision in an action between the city council of Dawson and the local water works company. The case has been before the state court for several years. An ordinance was passed in February, 1890, giving an exclusive franchise to the Dawson Water Works com-

pany and contracting for a period of twenty years for water for fire protection at the rate of $2,000 a year. The company complied with the ordinance in every respect and for a few years the city paid its annual charge for fire protection. The authorities passed a resolution in December, 1894, declaring their intention to abandon the contract and gave notice of this intention to the company. Evidence was produced, however, to the effect that in 1895 some of the members of the local fire department had never received any information as to the change of the relations between the city and the company and that in February of that year a fire had occurred, during which water was used from the hydrants of the company in the presence of the mayor and other city officials, who assisted in extinguishing the flames. The company brought suit for the $2,000 due it for 1895 for fire protection. The suit was fought by the city and lost in the lower court. The supreme court reverses the decision of the lower court, however, and holds that the twenty-year contract for an annual payment of $2,000 was a debt, although nearly all the other supreme courts of the United States have adopted the contrary view. It was argued that the city authorities should not be allowed to set up the defense insisted upon in this case, that of illegality, because the company had expended in good faith a considerable sum of money in constructing a plant, and it would practically be fraud to refuse to pay the sum stipulated in the contract for fire protection. The court's decision on this point was as follows: "All persons who deal with public officers act at their peril, and are charged by law with notice of the authority of the officers with whom they deal. If the city authorities of Dawson had no power under the constitution and laws of this state to hold the elections, and make the debt claimed to have been incurred in pursuance thereof, the water works company is charged with notice of such want of power; and it cannot be said to be a fraud upon it to set up a defense based upon a fact of which it was charged by law with notice."

Investigation of Electrolysis at Yonkers, N. Y.

A preliminary investigation, to determine whether electrolysis caused by street railway currents is likely to damage the water pipes of Yonkers, N. Y., was made by A. A. Knudson, of New York City, recently. A Weston two-scale volt meter, arranged for high or low readings, was used in making the tests. The tests, of which there were twenty-one, were made in various parts of the city, covering all of the lines of electric railway in operation. Of these tests, fourteen showed readings above one volt, five above three volts, and one as high as seventeen volts. The last reading was found on Yonkers avenue near the Mount Vernon boundary line, and two other high readings, one of seven volts and the other of eight and a half volts, were found on this avenue. A piece of lead pipe had been removed recently from the street near where the reading of seventeen volts was found, on account of failure, but the cause had not been realized by those who removed it. An examination on the part of Mr. Knudson showed unmistakable signs of electrolysis, and since the tests were made showing the heavy escape at this point, he considers it an excellent illustration of cause and effect. Mr. Knudson believes, as a result of this preliminary investigation, that there are at least eight different locations where the volt meter tests indicate a condition dangerous to the water pipes from electrolysis. As far as the tests have been carried two places have been found where the pipes are positive, with readings above two volts at both places. Some engineers hold that a difference of potential higher than one volt should not be allowed between the rails of a trolley road and water pipes, particularly if the pipes test positive to the rails. Mr. Knudson believes, however, that in view of the high pressure at Yonkers it will be unsafe to allow a greater difference of potential than half a volt maximum. This point can be better determined, however, by meter tests to discover the amount of current flowing.

To Prevent Pollution of Public Water Supplies.

The legislature of the state of Washington has passed an act to prevent the pollution of public water supplies. The act extends the jurisdiction of towns and cities over all property devoted to public water supplies, whether under public or private ownership; makes water pollution unlawful wherever the purity of the public supply is destroyed or endangered, declaring it to be a nuisance punishable on conviction by fines in any sum not to exceed $500; if nuisances are not abated one day after proof, or such time as the court may fix, a warrant shall be issued to the county sheriff and he shall forthwith abate the nuisance, the expense involved to be added to the costs against the party maintaining the nuisance. It shall also be the duty of the officer or officers in charge of the sanitary condition of each town and city to enforce the act, and municipalities or companies owning public water supplies to secure injunctions against the maintenance of the nuisance.

Increasing the Capacity of Gravity Water Mains.

In a paper read before the Municipal and County Engineers, J. B. Wilson, Assoc. M. Inst. C. E., Surveyor of the Rural District, Cockermouth, England, suggests a plan for increasing the capacity of gravity water mains. To provide "compensation water" to riparian owners below impounding reservoirs is common practice in England, and

Mr. Wilson suggests that as this water passes from the dam down the stream there is a great waste of power, which might be utilized by means of a hydrant motor to drive a pump, and thus increase the carrying capacity of the main. He also thinks that centrifugal pumps and screw propellors excel all other types of pumps for this purpose.

Durability of Wrought Iron Pipe.

A section of water pipe, 30 ft. long, was taken up at Rochester, N. Y., recently, which was laid twenty-five years ago. It was a thin, riveted wrought iron pipe, one-eighth of an inch in thickness, and was laid in 1874 by Thomas Leighton as a portion of the 24-inch supply pipe from Carroll to Fitzhugh race to the Holly pumping station. The pipe was practically as good as when it was laid twenty-five years ago, and the general opinion of the experts was that if it should be replaced it would last as long again. The pipe was made for another use, but the contractor, having it on hand, used it for the above purpose. Chief Engineer Kuichling has caused photographs of the pipe to be taken and a record of the cost of the pipe, its use and its condition will be made.

Legal Fight Over the Detroit Water Works.

Proceedings in the legal contest for the possession of the water works system of Detroit, Mich., were begun in the Wayne circuit court July 19 before Judges Hosmer, Lillibrodge, Carpenter and Waite. Fred A. Baker, attorney for the old water board, which refuses to deliver the water works and water board's property over to the board of public works, says there are three main grounds on which the Burch law is held unconstitutional, viz.:

First—Its title fails to state the object of the act properly or fully; an act must contain only one object and this has two main objects, one of abolishing the water board and the other of establishing what is called "free water."

Second—The new proposed system of raising the fund for maintaining the water system, spreading part of its cost on the general tax rolls instead of levying special rates, and doing this without giving the people's representatives, the council or estimators a chance to vote on it, is unconstitutional. This is the "free water" clause.

Third—The method of raising the interest for bonds is changed, control of the payment of bonds is changed, and the United States constitution, forbidding the states to pass laws "impairing the obligation of contracts," is infringed.

Water Improved by Aeration.

A marked influence is noticed on the quality of water supply treated by the water aerating plants of the Spring Valley Water Works company at San Francisco, Cal. Ralph A. Goulding, acting chemist of the city board of health states in his annual report for 1898, that the 8,000,000-gal. plant at the College Hill reservoir reduced the albumenoid ammonia from 0.00620 to 0.00416 part per 100,000, and the oxidizable organic matter from 5,000 to 1.665 parts. The free ammonia was increased about 0.00028 part by the aeration. At a similar plant on Clarendon Hights, the free ammonia was reduced from 0.00128 to 0.00012, the albuminoid ammonia from 0.00756 to 0.00252, and the oxidizable organic matter from 4.24 to 2.94. Aeration at the University Mound reservoir reduced the albuminoid ammonia from 0.00756 to 0.00492, and the oxidizable organic matter from 4.24 to 1.80; the free ammonia was increased from 0.00128 to 0.00212.

Appraisement of the Dubuque Water Works.

The taking of testimony in the Dubuque Water Works appraisement came to a close on the 6th of July, and the testimony of the expert engineers, which has all been printed in book form, has been taken up by the Board of Appraisement. The expert engineering testimony on valuation on both sides agreed fairly well on all details of the physical property, but some considerable difference developed on such items as the established value of the business, the value of a certain gravity of supply, locally known as the level, and the amount of depreciation to be deducted from the value of the old plant. The matter was further complicated by the fact that the water works company have planned and partially carried out new improvements to the plant, which, when completed, will cost some $200,000. The amount of valuation placed on the plant, including new improvements already under contract by each of the different experts, is as follows: John W. Hill, $664,076; John W. Alvord, $710,513; John T. Fanning, $684,553; Daniel W. Mead, $693,460; George H. Benzenburg, $691,668. These estimates were all made independently by the experts for the company. The city's experts, Messrs. Kiersted, McHarg, Artingstall and Chase, united in a joint report, signed by the four engineers so employed, which amounted to $485,733. The original cost of the old works, exclusive of the new improvements now under contract, is shown by the testimony to have been $559,000. It is expected that it will be some weeks before a decision is reached by the board of arbitration.

An Instance of Sewer Stoppage.

In his annual report for 1898, William H. Brooks, chief of the Bureau of Highways of Philadelphia, described an instance of sewer stoppage. The sewer is partly circular and partly egg-shaped, the largest section being 4½ feet in diameter and the smallest 3½x2 1-3 feet, and is about four miles long. It was a constant menace to the water supply, which it might pollute when surcharged. It was impossible to clean it for a time ow-

ing to the manholes being 1,000 feet apart, but others were finally constructed and the cleaning pushed with all possible dispatch. Many mills on the line of the sewer discharged their wastes in it from early Monday morning until Saturday night, leaving but a few hours during the week when the work could be done, and it consequently progressed slowly. The sewer was filled in places to within eight to twelve inches of the top with a mixture of cinders, cotton waste and coal tar, which clogged it so badly that it was of comparatively little use for the purpose for which it was designed.

Leakage Into Sewers.

In a recent report by James Owen, M. Am. Soc. C. E., of Newark, N. J., on the proposed outfall sewer to be jointly built by the municipalities of Newark, South Orange, West Orange, Irvington, Vailsburg and township of Millburn, he refers to the leakage into sewers as follows:

"After an experience of a number of years, I am obliged to state very empnatically that under the present system of manufacturing and laying the pipe drains it is impossible to make them water-tight. From observations made during the past three years I have come to the following general conclusion, that with a sewerage system partially underdrained in any given municipality, the congestion of the pipe occurs ten years earlier than if no ground water entered it; if there is no system of underdraining, the pipe sewer becomes congested twenty years earlier. To make the idea more clear if a sewer is designed for 4,000,000 gallons flow a day, at the end of thirty years, with partial underdrains the 4,000,000-gallon limit will be reached in twenty years and if no underdrains at all are used the 4,000,000-gallon limit will be reached in ten years. This condition of affairs arises only occasionally in extremely hot weather, and is not an increasing factor. Applying this rule to the plans under consideration, it would therefore be wise to increase the capacity of the sewer at least thirty-three per cent more than for the estimated discharge of the sewage proper. This, of course, includes the imperative requirement that all mains shall be laid with an underdrain, and that all laterals laid in wet soil shall also have an underdrain with free discharge. The benefit derived from the construction of the underdrains is at any rate worth their additional cost in the advantage it gives for thoroughly underdraining all wet ground and the complete drainage of cellars."

The Law as to Sewers in Pennsylvania

An opinion was handed down recently by Judge Jacob F. Slagle, at Pittsburg, Pa., in the contest over the Boggs-ave. sewer, where exceptions were taken to the viewers' awards by a number of property owners. The exceptions were based upon two facts; that the assessment was for the cost of a 15-inch sewer, which is larger than was necessary for drainage of expectant's property, and that certain properties were not assessed, which added to the assessment against the property of the expectants. Judge Slagle says: "The sewers as constructed were 16 and 18-inch sewers. The excess of cost over 15-inch sewer was deducted and charged to the city. The city officers testified that 15-inch sewers were the smallest public sewers laid by the city, and no evidence to the contrary was offered. There seemed to be an impression that the Supreme Court has decided that an assessment can only be made against any property for the cost of a sewer sufficient to drain that particular property, and that the limit in size was ten inches. It is scarcely necessary to say that no such ruling has been made. It seems clear that each property cannot be considered alone except as to special facts affecting its use of the sewer. It must be regarded in connection with other properties abutting on the sewer and having the use of it in common." He discusses the exceptions and says that a property owner cannot act for himself alone in the matter of drainage, but must join with neighbors for common good.

Meeting of American Society of Civil Engineers.

The thirty-first annual convention of the American Society of Civil Engineers, held at Cape May, N. J., was the best attended of any convention ever held by the society. The total number of names registered was nearly 600. Members of the nominating committee were elected to serve two years as follows: District No. 1, A. W. Trotter, 71 Broadway, New York; district No. 2, George B. Francis, resident engineer, Boston Terminal company, South Terminal Station, Boston, Mass.; district No. 3, T. McC. Leutze, first assistant engineer New York State Canals, 11 Pine-ave., Albany, N. Y.; district No. 4, W. G. Wilkins, consulting engineer, Westinghouse Building, Pittsburg, Pa.; district No. 5, Augustus Mordecai, assistant chief engineer Erie R. R., Garfield Building, Cleveland, O.; district No. 6, J. A. Ockerson, consulting engineer, member Mississippi River Commission, 2732 Pine-st., St. Louis, Mo.; district No. 7, H. N. Savage, engineer in charge Sweetwater Dam, National City, Cal. A resolution was presented by Samuel Whinery, and adopted, to the effect that the chief of the Twelfth Census should be urged to make arrangements to collect statistics of municipal works and that the board of direction should take the necessary steps to confer and advise with him. A resolution introduced by Mr. Seaman, proposing that the society should bear the traveling expenses of members of the nominating committee was referred to the board of directors with a suggestion that the board consider the advisability of any changes in the method of procedure of the nominating committee.

The subjects announced for discussion were as follows: (a) Should stream contamination by the sewage of cities be absolutely prohibited by law? (b) Should the purification of the sewage of cities be compulsory; and is this feasible for large cities? (c) Is filtration the coming solution of the pure water question for cities? (d) What is the proper

friction coefficient for use in the design of riveted steel pipe? Robert E. McMath of St. Louis, Mo., opened the discussion. He spoke in strong terms of Chicago's plan for getting rid of its sewage by sending it down the Illinois river through the new drainage canal, and declared that the Chicago scheme was without an originator—no one cared to assume the responsibility for its original conception—and it was now almost without a defender. Taking up the above questions he said: (a) The common law principle that one must not so conduct his affairs as to injure his neighbor was sufficient to stamp the discharge of sewage into any living waters as illegal; (b) would answer yes; in fact, he considered that any scheme in which no provision was included for innocuous disposal did not deserve to be called a plan for a system of sewerage; as to its feasibility for large cities, he referred to the experience of Berlin and Paris as proof that "it can be done, and we are the men to do it;" (c) while filtration might promise a remedy for polluted water, it is far better to have the water as pure as possible to begin with. Mr. McMath was followed by a discussion in which several members participated, among them being Prof. Gardner S. Williams, of Arnold University, Peter Milne, Kenneth Allen, of the Baltimore Sewerage commission and James Owen of Newark.

Technical Meetings.

At a meeting of the Scranton Engineers' Club H. W. Rowley read a paper on "Municipal Ownership of Asphalt Plants." A comparison of the work done at Wilkesbarre, Pa., where the city owns its plant, with that done by contract in Scranton, showed that the latter city obtained cheaper work by adhering to the contract system.

The annual convention of the Central States Water Works Association will be held at Cincinnati, O., in September.

The authorities of the Paris exposition have organized a series of congresses, including one on "Methods of Testing Materials," to which the International Association for Testing Materials will probably be invited. This association decided in 1895 to hold its second congress in Paris in 1900, and it has, therefore, abandoned the intention of holding a separate congress of its own, and will accept an invitation to participate in the general congress, on condition that it is given accommodation for a session to discuss its own affairs.

The annual meeting of the International Acetylene Association was held in Chicago July 11. The scope of the association was extended to include manufacturers of burners and other acetylene supplies in addition to gas generators and carbide. Arrangements were made to admit as associate members such persons as scientific men, inventors, agents, salesmen and others interested in the development of acetylene illumination. The officers elected for the current year were: President, Geo. Landis Wilson, Chicago; vice-president, W. T. Reynolds, Dana, Ind.; secretary and treasurer, J. B. Carroll, Chicago. The next meeting will be held Feb. 13, 1900.

The second annual meeting of the International Association for Testing Materials will be held at Pittsburg, Pa., Aug. 15 and 16.

The Connecticut Association of Civil Engineers and Surveyors visited Holyoke, Mass., July 19 through the courtesy of the Holyoke Water Power company for the purpose of seeing the new dam now under process of construction, and the Mt. Tom railway, both of which present engineering problems of interest.

The second biennial convention of the League of Wisconsin Municipalities was held at Fond du Lac, Wis., June 26 and 27. Papers were read as follows: "The Model Charter and Its Relation to Wisconsin Cities," John D. Butler, president Municipal League of Milwaukee; "The Problem of Municipal Water Supply," John B. Heim, Madison, Wis.; "The Need of a Uniform System of Accounting for Cities," Dr. S. E. Sparling, University of Wisconsin; "The Problem of Municipal Lighting," W. F. Hurd, Boscobel; "The Interest of the Taxpayer in City Government," W. C. Leitsch, Columbus; "Sewers and Sewage Disposal," City Engineer Fitch, Oshkosh.

The Connecticut Valley Highway Association held its annual clambake at Monson, Mass. Addresses were made by President W. L. Dickinson, of Springfield; W. W. McClintock, State Highway Commissioner, of Boston; Commissioner James H. McDonald, of Connecticunt, and others. Mr. McClintock defined four types of road, as follows: Highest standard—six inches of crushed and screened stone on top of a basis of telford, the latter placed on a surface of porous sand; a gravel road, which was only possible where a good quality of gravel was easily accessible; a gravel road, improved by spreading on it a thin layer of broken stone; a road built of a combination of broken stone, sand and clay. He said: "I predict that when the state has completed 2,000 miles of road the cities and towns will have completed as much more. When we began our work there were twenty-five steam rollers at work in this state. Today there are 150, and thirty-five towns are building and taking care of permanent roads. Within a few years Massachusetts will have the best roads of any state in the union."

Wear of a Common Brick Pavement—The Missouri Assessment Law.

To the Editor of Municipal Engineering:

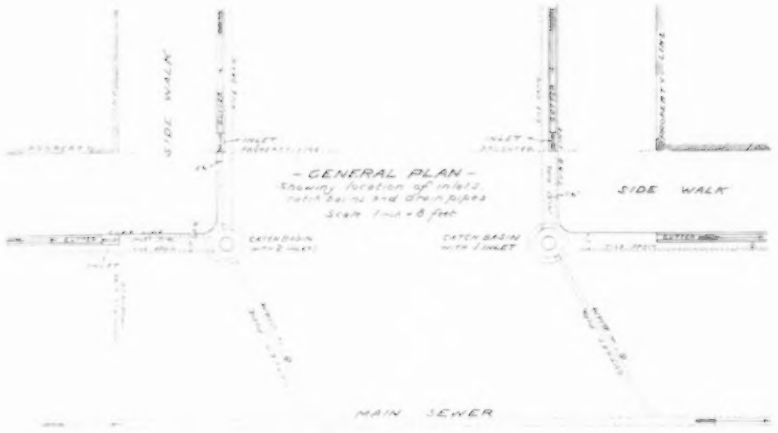
Sir—You published an item in the July number concerning the suit of Fay et al. vs. W. A. Myrick and Springfield, Mo. A short history of the street in question might not be amiss. In 1890 the street was paved with

a two-course layer of brick. The materials used at that time did not meet with the approval of the city engineer, Mr. C. P. Johnson, and were rejected, but after considerable argument they were allowed to be used by the council. These brick were not vitrified, and yet lasted nine years, which is almost incredible, considering the fact that the ground where they were laid was almost entirely "post oak flat," and when taken up at the end of a very long dry spell the entire street at the center as well as at the sides was found to be wet, and the brick in the bottom course were in many places crumbled and scaled so that they would not hold their own weight. After exposing the foundation for a week, in order to dry it as much as possible, the lower course was repaired and then, after sanding, it was rolled with a one-ton roller until it was even and smooth, and the sand was then swept off and the foundation again inspected and all broken brick were removed and replaced by good ones. After this a one-inch sand cushion was spread and then a good vitrified brick was laid, and at present the street is in a very much better condition than it ever was before.

The law making assessments by the front foot is a more just one than that intimated by Judge Phillips in his decision, and will undoubtedly be so held in the Supreme court. In upholding this method of assessment we claim: 1. That the building of a pavement on any street gives a greater ratio of benefit to vacant property than to improved property, since the increase in value is about the same to each and is always considered more than the cost of improvement. 2. That to assess with reference to improvements is to encourage truck gardening and ramshackle buildings in the uptown portion of a city where most of the public improvements are placed. 3. That the city at large bears its portion of the expense, in the cost of engineering, inspection, maintenance and other contingent expenses. 4. That the mayor, council and other city officers, acting with a majority petition of the property holders interested, are more competent to say how and which property is benefited than an interested individual who desires a different class of improvement or no improvement at all. 5. That a man owning a sink hole adjoining an improved lot is benefited by the improvements of his neighbor, and which cost him nothing. 6. That in this case there could not be any confiscation of property, as the unimproved lots are worth twenty times the cost of the improvement. There are many other reasons that may be cited.

The parties to this suit contended that the city should pay for the resurfacing of the street.

T. A. WHITE,
City Engineer, Springfield, Mo.



GENERAL PLAN OF CATCH BASINS AND SEWER INLETS AT SEATTLE, WASH.

Catch Basin and Sewer Inlet Used at Seattle.

To the Editor of Municipal Engineering:

Sir: I noticed in the June number of your magazine a description of a catch basin and inlet designed by Mr. Pierce of Ohio, and find it so near the design used here for the past five years, that I will send you a plan of ours, and will claim, that while ours may cost a trifle more, the same result is accomplished in a better manner, for the reason that Mr. Pierce's plan requires the pipe to be placed beneath the sidewalk and in most cities that portion of the street lying between the building line and the curbing is used as area way beneath the walk; and again, if it is not so used, and you find it necessary to repair the inlet, you are compelled to tear up the walk, which is usually much more expensive than the street, besides disturbing travel and hindering any business that may be located at or near the

place. When our inlet was designed, the principal point in view was to keep all crossings dry in time of storms, which can be done very successfully with a very few men that are familiar with the city.

HENRY W. SCOTT,
Asst. City Engineer, Seattle, Wash.

Mr. Scott's letter was referred to Mr. Pierce, who writes in answer: "Referring to the plan for draining street intersections sent you by your Seattle correspondent, and to the reasons he gives why it is more desirable than the plan shown in your June issue, I would say that if the expense is not considered (though we think 15 per cent. is worth considering) it is largely a matter of what is good practice in street improvement. We believe that all pipes should be laid outside of the roadway if possible, and we also know that this is being done on new allotments in many of the cities east of the Mississippi. In this the trench for the pipe is so near the curb that it will tend to make the curb insecure. Again, nearly all pavements are put down under a guarantee of from five to fifteen years, which prevents the city from opening them at their pleasure. One reason for laying our pipe on the lawn is that we can get about one foot more fall in the discharge pipe, giving a grade that will clear itself under all ordinary conditions. In our plan the gutters around the corners are made with a uniform grade from the closed walk to the intake. This cannot be where the basin is on the corner."

Municipal Department of Electricity.

The creation of a department of electricity, which shall have charge of all electrical systems in the city of Los Angeles, Cal., is proposed. The board of fire commissioners will be empowered to appoint a chief officer of the department, to be known as the city electrician, whose salary is fixed at $2,000 a year, and who will be required to give a bond in the sum of $1,000. The electrician will be allowed a deputy, to be known as inspector of wiring and appliances, and who is allowed to retain out of fees collected for his services not to exceed $1,080 a year. The electrician is required to enforce all ordinances in regard to the inspection and supervision of electrical wires and appliances in or upon the streets and about the buildings of the city. Ordinances pertaining to the same subjects accompany this, making provision for the wiring and buildings, installation of electric apparatus, etc.

Proposed Municipal Lighting and Telephone Plants.

The need of several amendments to the city charter is suggested by Mayor Henry V. Johnson of Denver, Col. He believes the city should own a lighting plant, but under the present charter it only has the authority to erect a plant to light the streets and public places of the city and not the authority to erect a plant for the purpose of supplying the citizens with light. The power necessary to do this can be supplied by an amendment. The charges for lights and telephones in Denver are believed by Mayor Johnson to be too high. The cost for telephones is $120 a year each. Mayor Johnson suggests that the citizens secure an ordinance granting them the right to erect and maintain a lighting and a telephone plant, which will give them these necessities at reduced rates.

St. Louis Seeks Protection from the Chicago Drainage Canal.

Suit will be entered in the federal court at Chicago by the city of St. Louis to prevent the operation of the Chicago drainage canal. A committee was appointed some time ago to investigate the drainage canal and recommended steps to protect the interests of St. Louis. This committee requested an opinion as to the standing of the city in the courts. The opinion was to the effect that the city could obtain an injunction against the operation of the canal if it could be shown that the pollution of the water was detrimental to any interest. A joint resolution was then passed, citing that to carry the scheme into effect would materially affect the interests of St. Louis injuriously and also, in perhaps a greater degree, the interests of the neighboring cities—Alton and East St. Louis—by polluting their only source of water supply and directing the city counselor to take such legal steps as may be necessary to enforce the rights and protect the interests of the city.

Municipal Reports.

Annual Reports of City of Bloomington, Ill., for the Year Ending April 30, 1899.

The general form of this report is fairly good. It shows the need of standard forms for making reports in its department of public works. It is possible from the city clerk's report to discover the amounts paid by the city for public improvements during the year, whether paid from general funds or special assessments, but there is no report of paving paid for by issuing local improvement bonds paid by special assessments in annual installments. The city engineer's report gives the total price bid for pavement and for intersections for contracts let during the year. It seems to be impossible to find out from the report what is the actual final cost of a contract for a given piece of pavement completed and paid for during the year. The same is true of sidewalks. The same difficulty does not exist regarding sewers, water mains or other city expenses. Detailed statements of all these are given by the city clerk. The report of the city treasurer gives a statement of the receipts from the installments on paving assessments for each street in process of payment, but here cannot be found any statement of the actual cost to the property-owners. The difference in treatment of paving contracts and others gives the opportunity for this omission of data.

Since the paving contracts let for the year amounted to $78,004.77, or one-third as much as all the disbursements of the city during the year, it is highly important that full details of the actual payments made on paving accounts should appear in the annual reports. Water and electric light plants are in the same station, but accounts are kept separately in the report. No details are given whereby it is possible to estimate the economy of this mode of operation. What is known to be an arbitrary distribution of fuel and other such expenses between the two services is made so that it is impossible to make any accurate estimates of economy. This is unfortunate because this system is attracting attention and many city officials are asking for full information for their own assistance. The same lack of detail is found in the reports of the superintendent of streets and the city engineer. The latter report even fails to give the lengths of the streets for which paving contracts are let. The same lack of information is found regarding the actual cost of work assessed directly upon the property, the figures for which do not pass through any of the funds in the city clerk's books, as in the case of pavements, and there is no detail of work actually done, the report consisting of a slight and imperfect outline of the letting of contracts. If the A. S. M. I. adopts standard forms of municipal reports it may be possible in time to secure better reports of munuicipal proceedings. Too often omissions and confusion are intentional, to cover up deficiencies or worse, but many reports are defective from lack of knowledge and experience among city officials, and standard forms adopted by competent authority will be very welcome in such cases.

Twenty-Fourth Annual Report of the Bangor, Me., Water Board, for the Municipal Year 1899. Walter F. Brown, Clerk; M. A. Sinclair, Supt.

The new standpipe leaked when water was first turned into it. The trouble was overcome by tapping holes in the bottom and pouring in sufficient grout to make the surface solid. The revenues were increased during the year $3,035.

Twenty-Fifth Annual Report of the Board of Water Commissioners of the City of Somerville, Mass. Frank E. Merrill, Supt.

The indebtedness on the water works was reduced $22,000 during the year. More was done in extending and improving the works than during any previous year, and the commissioners believe that they now have one of the best systems in the country. They estimate that they will have an average yearly surplus of $83,000 during the next ten years and they, therefore, proposed a reduction of 10 per cent. in rates, but this was vetoed by the mayor.

Tenth Annual Report of the Board of Public Works of Kansas City, Mo., for the Fiscal Year Ending April 17, 1899. R. M. Godfrey, Secy.

The year's expenditures of the board of public works amounted to $1,026,530, and the engineering services in connection with this amounted to $49,524. This embraced ten miles of Trinidad lake asphalt at an average cost of $2.12 per sq. yd., four and a half miles of American bituminous rock pavement at $2.10 per sq. yd., and 5.71 miles of brick at $1.48. The public work under contract at the beginning of the present fiscal year amounted to $411,598. For street lighting this city is now paying $12 per year each for gas lights, moonlight schedule; $110 each for electric arc lights, all night, and $17 each for gasoline lights, moonlight schedule. The receipts from the water department amounted to $410,570 and the total operating expenses were $354,553. The data covers all details quite fully. The tables of City Engineer Wise and Street Commissioner Sloan give all desirable information regarding work on streets, and the forms of the water department are equally comprehensive.

Twelfth Annual Report of the Street and Sewer Departments of Wilmington, Del., for 1899. Harvey J. Wiley, Secy.

The new street paving was largely vitrified brick, comprising 37,277 sq. yds. against 4,346 of granite block and 16,248 of telford and macadam. Work on sewers cost $30,564. Four grade crossings were abolished. Mr. T. Chalkley Hatton, the engineer who has had charge of the sewer construction, thinks that encouraging progress has been made in educating the people to properly appreciate sewerage facilities, and states that about 30 per cent. of all the houses in Wilmington are now connected with the sewers. The work has been in progress eight years and the total expenditures on the system up to this time amount to $714,187. The work during the last year was done by employes of the city under Mr. Hatton's direction.

Annual Report of the Board of Public Works of Woburn, Mass., for the year 1898. Frank B. French, City Engineer and Superintendent.

Mr. French points out to the city authorities that while their old Worthington pump, which has been in use for twenty-six years, does as good service as any of its age, it will be economical to buy a modern one. It pumps 295 gallons of water for each pound of coal consumed, while in Andover a pump built on the latest pattern of a like capacity has developed a duty of 724 gallons for each pound of coal consumed. The saving in coal, he says, would pay the investment. He shows that further saving may be made by the adoption of the meter system. When the plant was installed cement-lined pipe was used as a matter of economy. Its weakness under pressure, the damage resulting from escaping electric currents and even from the concussion of thunder and the direct effects of lightning has demonstrated that this was not economical, and now that the difference in the expense of the two kinds of pipe is slight he urges the use of cast iron pipe. In many other respects there are defects in the public works equipment largely as a result of mistaken economy of first cost, which the

engineer appreciates, but has had difficulty in convincing city officials of. Under great disadvantages very good results have been brought about. In street work macadamizing has been done at as low as 52.75 cents per sq. yd., and stone has been crushed at a net cost per ton of 93.54 cents.

Report of the Water Works of Battle Creek, Mich., for four years. W. W. Bridgen, Supt.

The Battle Creek water works are owned by the city. This report condenses the essential information regarding the plant and its operation, covering a period of four years, into a table occupying a single sheet about 8x12 inches in size. It shows that the cost of coal used was reduced from $1,410 in 1895 to $1,040 in 1898, although the water pumped increased from 258,000,000 to 270,000,000 gallons. The average pumping expense per 1,000 gallons was 1.2 cents, the operating expense 2.8 and the total expenses, with interest, 7.2. The daily per capita use of water was 43 gallons. Forty-three per cent. of the water is metered. The meter rate is 7 to 13 cents per 1,000 gallons and all new takers are required to use meters. The total receipts were $35,121.22, and expenses $19,463.77, leaving a surplus of $15,657.45.

Personal.

H. G. Paddock has been appointed city engineer at Moline, Ill.

Robert D. Gregg has been elected city engineer at Kankakee, Ill.

George H. Ayres has been elected borough engineer at Patton, Pa.

W. K. Woodruff has resigned his position as city engineer at Kankakee, Wis.

S. A. Davidson has resigned his position as city engineer of Phoenix, Ariz. Ter.

Charles E. Williams has been appointed director of public works at Bridgeport, Conn.

William B. Durant has been appointed president of the water board at Cambridge, Mass.

J. V. Mayhall has been elected superintendent of water works at Parkersburg, W. Va.

Jason McCafferty, C. E., London, O., was seriously injured by an electric car recently at Columbus, O.

C. C. Wilson has resigned his position as city engineer of Columbia, S. C., and will spend a year in Europe.

H. B. Patten, city engineer at Cheyenne, Wyo., has been appointed clerk in the office of the State Surveyor General.

F. F. Griswold, Manchester, N. H., has been appointed an assistant in the sewer department at Worcester, Mass.

R. J. Durley has been appointed professor of civil engineering in McGill University to succeed Prof. John T. Nicholson.

Cyrus Robinson has been appointed chief engineer of the Corliss department of the Westinghouse Machine company.

Charles Baker of Findlay, O., has been appointed superintendent of the water works and electric light systems at Sycamore, O.

Charles L. Ritter has resigned his position as superintendent of water works at Murphysboro, Ill., and will engage in the real estate business.

T. B. Rozine, city engineer at Charles City, Ia., has ceased to be a company commander in the volunteer service in Cuba and has returned to his civic duties.

Frank W. Cruikshank has resigned his position with the water department at Atlanta, Ga., to accept one with the H. Mueller Mfg. company of Decatur, Ill.

R. S. Buck, M. Am. Soc. C. E., has been appointed chief engineer of the proposed third municipal bridge across East river, between Brooklyn and New York.

R. V. West, superintendent of the electric light plant at Middletown, Pa., has been appointed superintendent of the People's Electric Light, Heat & Power company at Nanticoke, Pa.

Morris Knowles, Assoc. M. Am. Soc. C. E., has been engaged as principal assistant engineer with James H. Fuertes, M. Am. Soc. C. E., in the latter's work for the Philadelphia Water Commission.

C. E. Fowler, M. Am. Soc. C. E., New York City, will act as consulting engineer to the Terry & Tench construction company on the erection of the new East river bridge and the Boston Elevated railway.

President Moreland and Secretary Ogg of the Detroit Board of Public Works, both celebrated their birthday anniversaries on July 21. The former this year was forty-four and the latter thirty-eight years old.

L. E. Bozen of the University of Cincinnati read a paper before the Engineers' Club of Cincinnati recently, in which he reviewed the subject of determining the quality of iron and steel by microscopical examination.

George W. Fuller, M. Am. Soc. C. E., has established an office in the St. Paul bldg., New York City, where he will practice as a consulting engineer in matters relating to the purification of water and sewage disposal.

George H. Scranton, superintendent of the Columbus Railway company, Columbus, O., has tendered his resignation in order to accept the position of superintendent of construction of a street railway in Havana, Cuba.

M. G. Chapman, formerly superintendent of water works at Galion, O., and connected with the American Water Works and Guarantee company, for twelve years, is now connected with the water department at Shelby, O.

Arthur P. Davis, Assoc. M. Am. Soc. C. E., has been appointed hydrographer of the Isthmian Canal Commission, and will take charge of the investigations of stream flow, rainfall, water storage, etc., for the entire isthmus.

David A. McComb, superintendent of sewers, Washington, D. C., has obtained leave of absence for several months to assist Col. W. M. Black, Corps of Engineers, U. S. A., in designing a system of sewers for Havana, Cuba.

Elwood Mead, M. Am. Soc. C. E., has resigned his office as state engineer, which position he has held for twelve years, to become the irrigation expert for the division of experimental stations of the United States Department of Agriculture. Fred Bond, chief clerk to Surveyor-General Hanson, will succeed Mr. Mead.

The Philadelphia water commission has engaged James H. Fuertes, M. Am. Soc. C. E., to assist in collecting data for use in its study of the best method of supplying the city with good water. Rudolph Hering, Joseph M. Wilson, Samuel M. Gray, George S. Webster and John C. Trautwine, jr., of the commission visited Albany, N. Y., July 6 for the purpose of inspecting the 15,000,000-gal. municipal filter plant in Poughkeepsie.

Consolidation of Pipe Companies.

The wrought steel, iron and tube interests were consolidated July 12 at New York City by William N. Cromwell and Edmund C. Converse. The new company will be known as the National Tube company, the largest of the kind in the world and ranks third as a steel and iron corporation. The Krupp and Carnegie interests only exceed it. Besides controlling the domestic business the new corporation will continue to do business in Russia, Japan and Canada, where it already supplies tubular goods for oil wells, and merchant pipes to all other nations of the world. The executive officers are: President, Edmund C. Converse; chairman board of directors, Joshua Rhodes; first vice-president, in charge of manufacturing, E. J. Hearne; second vice-president, in charge of mercantile affairs, Horace Crosby; third vice-president, financial, Francis L. Potts; general manager of manufacturing department, A. S. Matheson; treasurer, Arthur F. Luke; assistant treasurer at Pittsburg, William H. Letshaw; general counsel, Sullivan and Cromwell. The board of directors is as follows: Joshua Rhodes, J. J. Vandergrift, Charles H. Coster, William B. Rhodes, F. J. Hearne, J. N. Vance, John Eaton, Francis Potts, E. R. Toby, Jonathan Rowland, Daniel O'Day, O. C. Barber, Henry Aird, John Don, Edmund C. Converse, William Nelson Cromwell, William S. Eaton, A. F. Luke, William K. Curtis, William P. Hamilton and A. H. Gillard. The plants controlled are: National Tube Works company, McKeesport, Pa.; Riverside Iron Works, blast furnaces, rolling mills and pipe works, Wheeling, W. Va.; United States Seamless Tube company, Christy Park, Va.; National Rolling Mills, McKeesport, Pa.; American Tube and Iron company's plants, Youngstown, O., and Middletown, Pa.; National Forge and Iron company, McKeesport, Pa.; Pennsylvania Tube Works, Pittsburg; Boston Iron and Steel company, McKeesport, Pa.; Allison Manufacturing company's tube mill, Philadelphia; Monongahela furnaces, McKeesport; Morris, Tasker & Co.'s Delaware iron plant, New Castle, Del.; Republic Iron Works, Pittsburg; Oil Wells Supply company's continental tube works and Elba iron works of Pittsburg; National Galvanizing Works, Versailles, Pa.; Chester Pipe and Tube company, Chester, Pa.; Monongahela Steel Works, McKeesport, Pa.; Hooven plant, Morristown, Pa.; Oil City Tube Works, Oil City, Pa.; Syracuse Tube Works, Syracuse, N. Y.; Ohio Tube company, Warren, O., and Western Tube company.

The Asphalt Company of America.

The incorporation, under the laws of New Jersey, of the Asphalt Company of America, with a capitalization of $30,000,000, has led to some speculation regarding the plans and the composition of the company. It is stated that the company is a trust which aims to control the supply of asphalt in America, but it is asserted that, while this may be the purpose of the promoters, it will not succeed as there are some of the important sources of supply that cannot be secured. The incorporators are Philadelphia men, including Sydney F. Tyler, president of the Fourth national bank; Geo. A. Huhn of Geo. A. Huhn & Sons, bankers and brokers, and E. A. Ballard of Shapley & Ballard, attorneys. These men have heretofore had no prominent connection with the asphalt business and it is therefore commonly believed that there are leading asphalt people back of them, but no authentic information in support of this supposition has yet become public. The articles of incorporation give the company broad scope, as they allow it authority "to manufacture, produce, purchase or otherwise acquire and use asphalt, stone, wood, brick, blocks, tiles, natural and artificial pavements and paving materials and supplies of all kinds, and all commodities, goods, wares, merchandise, articles and things which can be used as a part thereof or in connection therewith, or as a substitute therefor; and to sell, exchange, pledge, deal in, or otherwise dispose of the same in any manner whatsoever for the purpose of paving, roofing, or similar purposes, or any protective ornaments or useful purpose to which any form of natural or artificial asphalt or combination thereof or substitute therefor may be applied."

Damage Suits Against Asphalt Paving Companies.

Suits have been filed against the Western Paving and Supply company and the Indiana Bermudez Asphalt company by the Barber Asphalt Paving company and John J. Albright, of New York City, claiming damages amounting to over two millions of dollars. The suits grow out of the litigation between W. W. Averill and A. L. Barber, which was settled about a year ago. It is claimed by Albright that an improvement in asphalt paving was invented and patented by Averill on Jan. 14, 1879, and that the patent was sold to the American Asphalt Paving company on April 23, 1880. He claims that he bought it Aug. 3, 1898, and that it has been used without right by the defendants. Patents were granted E. J. De Smedt Jan. 25, 1887, and were purchased by the Barber Asphalt Paving company Dec. 21, 1887. This patent is the basis of the suit by the Barber company. The patents, it is claimed, cover essential methods in asphalt paving as done by the American companies. It is claimed by the attorneys of Albright that his rights were not sustained by the courts until ruled upon about a year ago in the Averill litigation, and hence the delay in instituting these suits. It is supposed that similar suits will be filed against other com-

panies engaged in laying asphalt pavements prior to the expiration of the patents. The claims for damages cover the amounts supposed to have been realized by the defendant companies from the work done by them.

Buena Vista Asphalt.

The Gilson Asphaltum company, the headquarters of which are located in St. Louis, now controls the supply of Buena Vista asphalt obtained from the region of Bakersfield, Cal. The So. Pac. R. R. company is building a railroad to the deposits near Bakersfield and the Gilson company is also establishing a refinery in Madison, Ill., opposite St. Louis, for treatment of the material preparatory to its use in street paving. They are having their own cars built for shipment of the asphalt. The company is prepared to deliver the material in unlimited quantities and they will sell to any contractors or companies who can give satisfactory evidence of their ability to go into the business successfully. The president of the Gilson Asphaltum company is Mr. C. O. Baxter, who has long been identified with the asphalt business. Mr. Baxter claims superior merits for Buena Vista asphalt, as shown by reports from trustworthy experts. He says that from 90 to 100 yards of 2-in. topping can be run with it. Pavements have been laid on two streets with this material in St. Louis. Eleventh-st., from Pestalozzi to Lynch-st., was paved on a foundation of old telford with 1½-in. binder and 1½-in. top last spring. This is a street used for heavy traffic only, consisting largely of brewery wagons. The work was done by the Gilsonite Roofing and Paving company. Buena Vista asphalt has also been laid this year on Theresa-ave., in St. Louis, and it presents a most excellent appearance. The Gilson company will not enter the field as a competitor for contracts, but will confine itself to supplying the material. The announcement is made that a large company is being formed in Chicago for the use of Buena Vista asphalt in street paving and arrangements are being made for its use in other sections of the country.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.

No. 626,321—June 6, 1899—Aqueduct, C. N. Dutton, New York, N. Y. The sides, supports and suspended floor are so arranged that the movements due to the weight carried shall be inward and an elastic resistance is then provided against the outward movement of the support.

No. 626,491—June 6, 1899.—Dredge for hard or soft mud. J. T. Ford, Galveston, Texas. The vertically movable suction pipe is mounted in a carriage of such form that the pipe may be made to lie over any desired portion of the bottom.

No. 627,079—June 13, 1899.—Fliter. J. A. Maignen, Philadelphia, Pa. The filter-bed consists of two layers, one of sand or other granular material, and the other of fibrous or powdered asbestos or other like material. A means is provided to evenly distribute the in-coming water over the bed.

No. 628,616—July 11, 1899.—Street-Sweeper. Samuel Stephens, Hamilton, Canada. The dirt is loosened by an advance rotary brush and then carried upward and forward into a dirt chamber by means of an endless chain brush.

No. 628,799—July 11, 1899.—Brick. W. M. Hazel, Philadelphia, Pa. The brick is provided on each face, on opposite sides of the transverse medial line, with wedge-shaped depressions which incline inward toward the ends of the brick.

No. 628,987—July 18, 1899.—Filter. J. A. Maignen, Philadelphia, Pa. Buried in the layers of the granular material of the filter bed is a series of perforated air outlet pipes and a means is provided to produce a partial vacuum in said pipes.

No. 629,028—July 18, 1899.—Dam. G. L. Cudned, New York, N. Y., assignor of seven-eighths to E. L. Zalinski and H. Tweddle, same place. The dam consists of a series of horizontal cables anchored at their ends, a transverse series of vertical supports secured to the cables and a wire-mesh section between cables and supports.

No. 629,133—July 18, 1899—Subaquaceous tunnel and method of constructing same. W. H. Knight and F. M. Lande, New York, N. Y. The tunnel consists of a series of tubular metallic shells having a water-proof lining and an interior lining of cemented material.

No. 629,135—July 18,1899. Subaquaceous tunnel and method of constructing same. Lewis Nixon and W. H. Knight, New York, N. Y. Somewhat similar to the preceding but differing in details of construction.

Trade Notes.

The Omega Cement company, Reading, Mich., has been organized.

The establishment of a paving brick plant is contemplated at Sullivan, Ind.

The Cummings Cement company, Akron, N. Y., will drill a second gas well on its property.

The cement works of Fowler & Pay, Austin, Minn., which were destroyed by fire May 14, will be rebuilt.

The Atichson Vitrified Brick company, Atchison, Kas., is considering the question of building another plant.

The works of the Merrifield Cement company on Tongue river, near Grand Forks, N. D., are nearly completed.

The Carl Prussing Cement company, Chicago, Ill., has purchased land near La Salle, Ill., and will build a cement mill.

The Illinois Sewer Pipe company of Chicago has been incorporated by William Carey, W. H. Olson and Moses Bryant.

New York capitalists contemplate erecting cement works at Plattenburg, Hunterdon county, N. J., according to press reports.

The Barber Asphalt Paving company,

New York City, has removed its offices from 503 Fifth-ave. to the Presbyterian Building, Borough of Manhattan.

The Lawrence Vitrified Brick and Tile company, Lawrence, Kas., has been incorporated by A. Monroe, A. Marks, J. N. Roberts, M. Robinson and others.

The Barr Pumping Engine company, Philadelphia, has been awarded the contract for a 6,000,000 gal. high duty crank and flywheel engine for New Brunswick, N. J.

A vitrified brick plant will be established at Princeton, Ind., by John Gaffney of St. Louis, Mo., at a cost of $100,000. The plant will have a daily capacity of 75,000 brick.

F. E. Matthews, city engineer at Merrill, Wis., desires samples and records of domestic Portland cement. The city contemplates the construction of 3,000 feet of 24-in. crock sewers.

Leedham & Anthony White, C. B. E. Cheffins and Robert Carling, English cement manufacturers, are reported as having inspected Michigan Portland cement mills with a view of investing.

The Cumberland Valley Cement company, Washington, D. C., has been incorporated under the laws of West Virginia, by S. D. Lincoln, P. J. Brennan, J. H. Crawford, T. B. Walker and J. G. Walters, to manufacture cement and lime.

Local capitalists at Fisher's and Pleasant Lakes, near Three Rivers, Mich., have secured options of rich marl beds and contemplate building a Portland cement plant, according to press reports.

The city of Lowell, Mass., has ordered iron paving blocks from Seth J. Buckland of Springfield, Mass., for paving along 100 feet of street railway track as a test. The blocks will be used in connection with an asphaltina pavement.

The Iola Portland Cement company has been incorporated under the laws of West Virginia by Detroit parties, and will deal in Portland cement on a large scale. The incorporators are J. T. Holmes, C. J. Lockley, H. P. Harding, G. M. Connor and C. H. Hatch of Detroit.

The New York Filter Mfg. company, 26 Cortlandt-st., New York City, has a contract for water works filter plants of 3,000,000 gals. daily capacity for Hornellsville, N. Y. The company's western associates, the O. H. Jewell Filter company of Chicago, has orders for filter plants as follows: Clarksville, Tenn., 1,500,000 gals.; Chihuahua, Mex., 1,000,000 gals.; Waterloo, Ia., increase of 500,000 gals.

The formal organization of the Diamond Light company was effected at Syracuse, N. Y., July 12 and officers elected as follows: President, P. L. Salmon; vice-president, John Dunn, jr.; secretary and treasurer, Theodore L. Poole. Directors—John Dunn, jr.; A. E. Nettleton, W. L. Smith, Theodore L. Poole, Arthur R. Peck, P. L. Salmon, Chas. S. Averill and F. E. Hale of Syracuse, and Chas. W. Dickel of New York City.

A verdict was rendered in the case of A. A. Woods, receiver for the New Orleans Sewerage company, vs. the American Surety company, favorable to the plaintiff. The suit was to recover from the defendant surety on the bond of Stewart & McDermott, contractors, for the laying of the sewerage system, the sum of $180,763.66 for damages caused by the contractors abandoning the contract. The amount sued for in the petition was $100,000, which was the sum total given by the surety company. The verdict was for $90,000.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Hamilton, O.—Judge Neilan made perpetual July 10 the injunction to restrain the execution of a proposed contract for paving Second-st.

Cleveland, O.—An ordinance providing a penalty of from $25 to $100 for driving leaky oil and acid wagons over asphalt pavements has been introduced.

Duluth, Minn.—Recent storms washed pavements loose in several places and damaged macadamized roads. The estimated damage is about $2,500.

Detroit, Mich.—Mayor Maybury's second veto of the proposed asphalt paving in Philadelphia-ave. resulted in the project being tabled for one year.

Kansas City, Mo.—The board of public works has requested the council to pass an ordinance directing the Metropolitan Street Railway company to pave between its tracks in the same manner, at the same time and with the same material that is used on the rest of the streets.

Anderson, Ind.—Judge Walker heard early in July the evidence and argument in the injunction proceedings against the proposed creosote block paving on Ninth-st. The contract for the paving was awarded to the Hoosier Construction company of Indianapolis, but a controversy arose over the kind of material to be used, resulting in litigation.

Worcester, Mass.—The aldermanic committee will recommend the adoption of an order providing for an ordinance to govern the laying out of private streets. The ordinance provides that all streets laid out across private land shall comply with the requirements as to grade and width, and that the street commissioner shall have the power to close such streets as do not conform to the requirements.

Mineloa, N. Y.—Permission has been granted Henry B. Anderson of Great Neck for opening the cross sections in the new county roads in the towns of North Hempstead and Oyster Bay, for the purpose of taking measurements of the quantity of stone that was placed on the roads when constructed. It is claimed that the full quota of stone required by the specifications was not placed on the roads and Mr. Anderson represents a tax-payers' movement in making the investigation.

Elizabeth, N. J.—The street committee of the common council has ordered Contractor Fitzgerald to take up the new paving on S. Park-st., more than half of which he had completed. The specifications called for a 12-in. cut filled in with sand, while only 10-ins. was used. The curbs were to be backed with sand, but none at all was used. The flagstones for the crosswalls were to have been 8 ins. thick, but were only 4 ins.

Newark, N. J.—Judge Child confirmed the reassessment for paving Harvey-st., from Mt. Pleasant-ave. to Belleville-ave. The property-owners made a fight against the assessment five years ago, when the pavement was laid. The pavement is of asphalt and is two blocks long. The opposition was on the general ground that the assessments for those parts near Mt. Pleasant Cemetery were too high, as the proximity of the cemetery made the sale of lots problematical.

The total assessment finally agreed upon was $6,454.75.

Chicago, Ill.—A boulevard to connect the North and South Side park systems has been suggested by John C. Bonell. The boulevard, which is in the form of a semi-circle 1½ miles long, contemplates the construction of a driveway 100 feet wide, beginning at Jackson boulevard and ascending on a gradient of 3 per cent.—a rise of 3 ft. in 100—to 111 ft. at the mouth of the Chicago river; thence it will descend on the same gradient to Chicago-ave. or Oak-st. This would give a roadway 7,400 feet long or a semi-circle having a radius of 3,300 ft. The structure would be of steel supported by steel and stone piers. The roadway proper would be paved with asphalt and divided into two driveways for carriages and light vehicles, two for bicycles and two for foot passengers.

CONTEMPLATED WORK.

Berne, Ind.—Brick paving is proposed for the streets.

Auburn, N. Y.—Asphalt paving is contemplated for South-st.

Bloomington, Ill.—Asphalt paving is desired for Fell-ave.

Washington, Ind.—The question of street paving is being agitated.

Evansville, Ind.—Brick paving has been ordered in a large number of alleys.

Ashland, Wis.—Brick paving is contemplated for about four blocks of streets.

Gainesville, Fla.—The committee has been authorized to improve the streets.

Leavenworth, Kas.—S. Fourth-st. will be paved with brick from Cherokee to Linn.

Freeport, Ill.—A petition is being circulated for brick paving for Chicago-st.

Avalon, N. J.—An expenditure of $50,000 for street improvements is contemplated.

Easthampton, Conn.—The council has voted to expend $9,000 for building macadam roads.

Sauk Center, Wis.—Cement walks have been ordered built on Fourth and Pine-sts.

Anderson, Ind.—It has been suggested that Twenty-first-st. be made into a boulevard.

Irvington, N. J.—A hearing will be given Aug. 15 on the petition to macadamizie Cottage-st.

Rochester, N. Y.—A bicycle path, 4 ft. wide, will be constructed on the new river bridge.

Spokane, Wash.—Ordinances were passed July 17 for paving Lincoln, Stevens and Monroe-sts.

Danville, Ill.—Paving is contemplated for Main-st., from Buchanan to Bowman. Cy. Engr. Marten.

Cohoes, N. Y.—A resolution was passed July 12 to repave Mohawk-st., from Ontario to Saratoga.

Kendallville, Ind.—Brick paving is contemplated for several blocks of streets. James Graves, Mayor.

Parkersburg, W. Va.—A petition has been presented to council for paving Gould-ave., from St. Marys-ave. to Spring-st.

Midland City, Mich.—Plans and specifications for brick street paving are being made by Riggs & Sherman, of Toledo, O.

New Rochelle, N. Y.—The question of paving with brick or asphalt is being considered. Mayor Dillon.

Quincy, Ill.—Brick paving is desired for Grove-ave., from Eighteenth-st. to East-ave, by the residents.

Bay City, Mich.—Brick paving on concrete has been recommended for Jackson-st., from First-st. to Center-ave.

Kansas City, Mo.—Resolutions have been adopted for paving Eighth, Windsor, Independence, Indiana and Fifteenth-sts.

Denver, Col.—The engineer has been instructed to prepare preliminary plans for paving Water-st., from Eleventh to Elliot.

Topeka, Kas.—Petitions were favorably reported July 11 for paving King, Fillmore and Thirteenth-sts. and Topeka-ave.

Cambridge, Mass.—The city council ordered July 11 that Pearl and Prospect-sts. and Harvard-square be paved with brick.

Moline, Ill.—A petition for paving Hill-st., from Eighth to Ninth, has been unanimously signed by the property-owners.

McKinney, Tex.—Vitrified brick paving is proposed for the public square and each of the side streets one block from the square.

Erie, Pa.—Ordinances were adopted July 17 for paving Walnut-st., from Eighth to Twelfth, and Fifth-st., from Sassafras to Walnut.

Madison, Wis.—Asphalt paving was definitely decided upon July 12 for the streets around the capital park. Mayor Haven; Cy. Clk. Norsman.

Monmouth, Ill.—The board of local improvement decided June 11 to pave First-st. and Euclid-ave. with single-course brick. Estimated cost, $11,962.75.

Greensboro, N. C.—(Special)—By a vote of 859 to 2, this city decided to issue $300,000 bonds for improvements, of which $75,000 is for street work.

Kearny, N. J.—Resolutions have been adopted requesting the common council to appropriate $15,000 for the repaving and improvement of streets.

Galesburg, Ill.—An ordinance for paving W. Berrien-st. with single-course brick was favorably reported July 17. Mayor Carney; Cy. Engr. Blanding.

Newark, N. J.—An ordinance has been passed to repave Lombardy-place, from Lombardy-st. to Front-st., with granite blocks on sand. Jas. M. Seymour, mayor.

Iowa City, Ia.—The city council has ordered that the brick paving on Clinton-st., between College and Washington, be taken up and relaid on a concrete foundation.

Gilmore, Ill.—A. D. Thompson of Peoria, Ill., has been authorized to prepare plans and specifications for brick paving on Central and Crescent-sts., in this city.

Mobile, Ala.—A resolution was adopted July 7 to appoint a committee of five to investigate all kinds of paving material preparatory to paving the different streets.

Champaign, Ill.—Brick paving with concrete curb and foundation is contemplated for Burrill-ave., through the University grounds, by the authorities of the University.

Los Angeles, Cal.—A petition has been filed asking that a cement walk and curb be laid on both sides of Third-st., from Boylston-st. to the western tunnel entrance.

Highland Park, Mich.—Estimates have been prepared for sheet asphalt, block asphalt, paving blocks and cedar block on concrete for Woodward-ave. Engr. Ashwell.

Port Clinton, O.—Resolutions have been passed declaring it necessary to issue bonds for paving with block, curbing, draining, etc., Depot and Second-sts. Geo. F. Meyer jr., clk.

Winnipeg, Man.—Carlton-st., from Portage to Cumberland-ave., will be macadamized. A granite sidewalk will be constructed in Assiniboin-ave., from Kennedy to Smith. C. J. Brown, cy. clk.

Milwaukee, Wis.—The board of public works recommended, July 17, asphalt paving on Twelfth-st., between Grand-ave. and Cedar-st., and granite on concrete for Galena-st., between Second and Third.

Danville, Va.—The city council has decided to repave Main-st., from Dan river to the City Hall, with Belgian blocks, and from the City Hall to S. Main with brick. The council is undecided as to whether to let the contract or have it done by the city with its own force.

Newark, N. J.—The roads and assessment committee of the board of freeholders adopted a resolution July 17 requesting James Owen, co. engr., to prepare specifications for estimates for paving with cobblestones the gutters of Bloomfield-ave., from the Methodist church to the D., L. & W. R. R., in Montclair; Springfield-ave., from

Union-ave. to Wall-st.; Park-ave., from Glenwood-ave. to Washington Terrace. It was also decided to readvertise for bids for repaving Bloomfield-ave., in Verona and Caldwell.

CONTRACTS TO BE LET.

Rensselaer, Ind.—Bids are asked until Aug. 14 for macadamizing sundry streets. Schuyler C. Irwin, cy. clk.

Gallipolis, O.—Bids are asked until Aug. 7 for paving several streets with brick. T. E. Bradbury, cy. clk.

Washington, D. C.—Bids are asked until Aug. 7 for furnishing granite curbing. John B. Wight, prest. dist. comrs.

Bloom, Ill.—Bids are asked until Aug. 5 for constructing macadam roads in Bloom, Chicago Heights. William Krause, chrmn.

Knox, Ind.—Bids are asked until Aug. 5 for paving Main-st. with brick. Mark L. Bozarth, clk.; Isaac Still, prest.

Wabash, Ind.—Bids are asked until Aug. 14 for paving an alley with brick, and paving sidewalks in a number of streets.

Toledo, O.—Bids are asked until Aug. 14 for paving Oakwood-ave. with asphalt, brick or granite. William O. Holst, cy. clk.

Bowling Green, O.—Bids are asked until Aug. 5 for macadamizing a road 5½ mis. in length. L. B. Fraker, engr. co. comrs.

Plymouth, Ind.—(Special)—R. B. Oglesbee, city attorney, says that bids will be asked soon for a considerable amount of paving.

Vevay, Ind.—Bids are asked until Aug. 8 for building free gravel and macadamized roads in Cotton twp. J. E. Hart, co. audt.

Madisonville, O.—Bids are asked until Aug. 3 for macadamizing, graveling, cement curbs and gutters, drains, etc. Bennett Carter, vil. clk.

Grand Forks, N. D.—Bids are asked until Aug. 7 for paving and curbing Hiver-ave., Skidmore-ave. and Louis boulevard. F. A. Brown, cy. audt.

Elizabeth, N. J.—Bids are asked until Aug. 4 for about 15,000 sq. yds. of brick, trap block and telford paving. N. K. Thompson, st. comrs.

Evanston, Ill.—Bids are asked until Aug. 3 for repairing Dodge-st., with macadam. Adolph Arndt, Anton Blocks, D. M. Garnett, bd. highway comrs.

Bradford, Pa.—Bids are asked until Aug. 7 for building 150 ft. of sidewalk upon the stone retaining wall on E. Main-st. J. F. Robinson, st. comr.

Cleveland, O.—Bids are asked until Aug. 9 for paving Amesbury-ave., from Hough-ave. to Crawford road, with brick. Walter P. Rice, dir. pub. wks.

Sharpsburg, Pa.—Bids are asked until Aug. 1 for grading, curbing and paving with brick, on broken stone foundation, five streets. H. Z. Ayres, boro. clk.

Lewisburg, Ky.—Bids are asked until Aug. 1 for building 250 or 300 yds. of pike, 12 ins. of stone in center and 4 ins. at edge. W. S. Wyatt, chrmn. com.

Omaha, Neb.—Bids are asked until Aug. 4 for paving Thirty-fifth-st., and repaving Twenty-fifth-st., from Farnam to Dodge, with asphalt, brick or stone, and curbing. Andrew Rosewater, chrmn. D. P. W.

Lakewood, O.—Sealed proposals will be received by the board of trustees until Aug. 14 for paving Robinwood-ave., between Detroit-st. and Madison-ave., with asphalt. John French, clk. Hamlet of Lakewood; R. J. Wood, C. E.

CONTRACTS AWARDED.

Boston, Mass.—The contract for macadamizing Seldon-st. was awarded to Jas. McGovern for $10,640.

Youngstown, O.—The lowest bids submitted for paving Spring-st. were as follows; Vetter & Heasley, $11,375 for block asphalt; Barber Asphalt company, $11274 for sheet asphalt.

Arlington, N. J.—The contract for macadamizing several streets was awarded to E. F. Galloway.

Bridgeport, Conn.—The contract for paving State-st. with asphalt was awarded to the Standard Asphalt company.

Norwich, N. Y.—The contract for paving E. Main-st. was awarded to J. K. Van Campen of Olean for $25,714.35.

Utica, N. Y.—The contract for paving Erie-st. has been awarded to the Warren-Scharf Asphalt Paving company for $29,-848.10.

Somerville, Mass.—The contract for paving Washington-st. was awarded July 12 to Patrick McGovern for $3,774.

Jacksonville, Ill.—The contract for 1½ miles of brick paving was awarded July 11 to John Cherry of Bloomington, Ill.

Omaha, Neb.—Hugh Murphy secured the contract June 30 for paving with asphalt four intersections at $2.12 a sq. yd.

Winona, Minn.—The contract for paving Center-st. was awarded July 3 to the Winona Construction company for $3,150.

Valparaiso, Ind.—The contract for building 28 miles of gravel roads was awarded July 6 to John McGilcuddy for $97,270.

Rome, N. Y.—The contract for paving James and Dominick-sts. was awarded July 7 to Fred P. Spalding of Bethlehem, Pa., for $19,900.

Pontiac, Mich.—The contract for paving Saginaw and E. Lawrence-sts. was awarded July 11 to Lennane Bros. of Detroit for $51,107.

St. Paul, Minn.—The contract for paving Chestnut, from Seventh to the levee, was awarded June 29 to Fielding & Shepley for $15,582.

Montclair, N. J.—The contract for improving the Bloomfield roads was awarded to Osborne & Marsellis of Upper Montclair for $75,000.

Springfield, Ill.—The contract for paving Monumental-ave., from N. Grand-ave. to Oak Ridge-ave., has been awarded to J. F. Bretz & Son.

Peoria, Ill.—The Warren-Scharf Asphalt Paving company was awarded the contract July 17 for paving Perry and Callendar-aves. with asphalt at $1.70 a sq. yd.

Toledo, O.—Paving contracts were awarded July 17 as follows: Navarre-ave., Logan block, Wm. P. McMahon, $26,894.96; Laskey-ave., asphalt, F. E. Cole, $5,936.05.

Binghamton, N. Y.—Sheehan & McGhan of Bradford, Pa., secured the contract July 7 for paving Carroll, Hawley and Washington-sts., at $1.88 a sq. yd. Park standard brick will be used.

Indianapolis, Ind.—The contract for constructing cement walks in Ash-st., from Fourteenth to Sixteenth, was awarded to John Moore July 12 at 57¼ cents for 5-ft. and 36 cents for 3-ft. walks.

Bucyrus, O.—Contracts for improving seven roads have been awarded to S. S. Eaton & Son of Lafayette, Ind., at from $2,050 to $2,950 a mile. A. H. Gardner has the contract for one road at $2,769 a mile.

Newark, N. J.—The contracts for asphalt paving were awarded July 20 to the Barber Asphalt Paving company as follows: Clifton-ave., 5,700 sq. yds., $1.95; Burnet, Green, Elm, Livingston and Charlton-sts., $1.90.

Chillicothe, O.—Paving contracts have been awarded as follows: Fourth-st., asphalt block, Sullivan & Graham, Columbus, O., $15,235; Pfaff, Ringwald & Smith, city, Second-st., brick, $6,763; Paint-st., brick, $13,-735; Main-st., brick, $9,412.

Johnstown, N. Y.—Paving contracts were awarded July 7 as follows: Washington-st., Martin Murray of Troy. Eastern paving brick, $1.89 a sq. yd.; N. Perry-st., Metropolitan Paving and Construction company, Eastern brick, for $8,707.65.

Albany, N. Y.—The contract for paving Catherine and Delaware-sts. with brick were

awarded July 2 to Mulderry Bros. Edward F. Dillon was awarded the contract July 17 for paving Clinton-st. with brick for $8,707.65.

Kansas City, Mo.—The Barber Asphalt Paving company secured the contract for paving Sixth-st. at $2.30 a sq. yd. The McTiernan & Halpin Paving company was awarded the contract July 14 for paving the west end of Independence boulevard at $1.86 a sq. yd.

Ft. Wayne, Ind.—Paving contracts were awarded to C. E. Moellering & Co. as follows: Baker-st., Met. block, $5.85 per lin. ft.; Madison-st., Met. block, $6.19; Walton-ave., Met. blk., $5.54; Fourth-st., Met. block, $5.02; Wayne-st., asphalt block, $8.98.

Hamilton, O.—The lowest bids received July 15 for paving N. and S. Third-sts. were as follows: S. Third—Asphalt, Warren-Scharf Asphalt Paving company, $2.18; block asphalt, J. M. Quill, $2.17; brick, W. N. Andrews, $1.70. N. Third—Asphalt, Warren-Scharf company, $2.18; block asphalt, W. N. Andrews, $2.35; brick, W. N. Andrews, $1.70.

Louisville, Ky.—The contracts for reconstructing a number of asphalt streets were awarded, July 18, as follows: Barber Asphalt company—Preston-st., $3,655.40; Twenty-sixth-st., $14,089; Ormsby-ave., $3,276.90; Second-st., $15,576.80; W. Washington-st.—Two sections, $2,264.75 and $2,264.75; total, $41,138.60. Breckenridge company—Broadway, Second to Third, $7,310.

Des Moines, Ia.—Bids were received July 11 for paving Eighteenth-st., between Woodland-ave. and Crocker-st., as follows: Likes Improvement company, one-course brick on 6-in. cement and rock foundation, $1.38; brick on cement and tile, $1.33; brick on cement and gravel, $1.28. Iowa Brick company—Brick on cement and rock, $1.36; brick on cement tile, $1.34. Flint Brick company—Brick on cement and gravel, $1.34¼. The bids will be submitted to the interested property-owners in order to decide upon the kind of foundation, before the contract is awarded.

Philadelphia, Pa.—Contracts were awarded June 28 for paving about 700,000 sq. yds. of streets at an average price of $2.47 a sq. yd. Of these streets 147 were for asphalt, 21 for slag, 4 for vitrified brick and 8 for granite. The successful bidders were the Vulcanite Paving company, Pennsylvania Asphalt Paving company, Alcatraz Paving company, Richardson & Ross and W. S. P. Shields. Contracts were awarded July 14 as follows: Belgian blocks, Thos. Cunningham; vitrified brick, Aaron Ward and Edward F. Bemis. Bids were received for paving 48 streets with asphalt, but were not made public.

Rochester, N. Y.—Paving contracts have been awarded during July as follows: July 5—Sherman-st., asphalt, Whitmore, Rauber & Vicinus, $2.15 a sq. yd.; Jefferson-st., asphalt, Warren-Scharf Asphalt company, $2.24; Frost-ave., asphalt, Rock Asphalt Pavement company, $2.20; Washington-st., Rock Asphalt Pavement company, $2.20. July 8—Tremont-st., macadam, Geo. Chambers, $21,538; Lawrence-st., asphalt, Warren-Scharf company, $2.24; Irving-place, Medina block, Whitmore, Rauber & Vicinus, $3,670. Cement sidewalks, Oriole-st. $1,466, Warwick-ave. $1,025, Stout-ave. $5.13, J. Commons & Sons; Averill-ave. $1,196, LaMont-place $1,077.90, and N. Colvin-st. $672, E. D. Oliver. July 17—Cement walks, Dubelbeiss-st., H. B. Hooker & Co., $1,566.20; Elba-st., $880, and Seward-st., $2,329, T. Holahan.

Detroit, Mich.—The largest and most important of paving bids received this year were opened on July 21. The lowest bids, all on cedar blocks, were as follows:

Alfred-st., from Rivard-st. to Russell-st., Medina and Elyria curbstone; H. Merdian, Medina curb, $1,755.90, $1.61 per square yard; Elyria curb, $1,623.24, $149 per square yard.

Brewster-st., from Rivard-st. to Russell-st., Medina and Elyria curbstone; H. Merdian, Medina curb, $1,740.40, $1.69 per square yard; Elyria curb, $1,607.644 $1.47 per square yard.

Hecla-ave., from Piquette-ave. to Milwaukee-ave., Medina and Elyria curbstone; James Grant, Medina curb, $3,597.81, $1.49 per square yard; H. Merdian, Elyria curb, $3,378.74, $1.40 per square yard.

Humboldt-ave., from Warren-ave. to Grand-ave., Medina and Elyria curbstone; J. Porath, Medina curb, $5,053.02, $1.46 per square yard; Elyria curb, $4,528.65, $1.39 per square yard.

Theodore-st., from Hastings-st. to Russell-st., Medina and Elyria curbstone; James Grant, Medina curb, $5,194.13, $1.54 per square yard; William Lappin, Elyria curb, $4,926.39, $1.45 per square yard. John McVicar bid lower, but specified Berea curb.

Gratiot-ave., from McDougall-ave. to Mt. Elliott-ave., Medina and Elyria curbstone; George E. Currie, Medina curb, $12,705.10, $1.02 per square yard; William Lappin, Elyria curb, $12,917.61, $1.11 per square yard.

Ferry-ave., from Russell-st. to St. Aubin-ave.; Arthur C. Lloyd, Medina curb, $7,317.48, $1.21 per square yard; Elyria curb, $7,177.08, $1.18 per square yard.

Wayne-st., from Woodbridge-st. to Jefferson-ave., Medina and Elyria curbstone; J. A. Mercier, $997.08, $1.45 per square yard; Wm. Lappin, $1,034.42, $1.50 per square yard.

Third-ave., from Merrick-ave. to Holden-ave., Medina and Elyria curbstone; J. A. Mercier, Medina curb, $7,407.36, $1.21 per square yard; James Grant, $7,203.88, $1.17 per square yard.

Forest-ave., from Woodward-ave. to Cass-ave., Medina curbstone; J. Porath, Medina curb, $3,046.19, $1.75 per square yard; same bidders, Elyria curb, $3,022.09, $1.70 per square yard.

SEWERS.

Jersey City, N. J.—The New Jersey Sewerage Commission and the committees from Newark, Paterson and Passaic visited Reading, Pa., July 11, to study the sewerage system of that city.

Newark, N. J.—The preliminary work for the proposed joint tide outlet sewer to Staten Island has been completed. The final estimates and apportionments to the different municipalities concerned are as follows: Divisions of main sewer, main trunk—Length, 33,200 feet; size, 36 inches. First division west branch—Length, 13,735 feet; size, 33 inches. Second division west branch—Length, 9,400 feet; size, 22 and 20 inches. Third division west branch—Length, 10,500 feet; size, 18 inches. Eastern division—Length, 40,700; size, 20 to 8 inches. Millburn and Summit division—Length, 13,000 feet; size, 24 to 18 inches. Exclusive of annual interest on first cost. Statement of apportionment of various sections of sewers: West Orange Township, $62,485; South Orange Township, $33,402; Millburn, $25,257; Summit, $77,634; Vailsburg, $32,188; Newark, $30,823; South Orange Village, $60,963; Irvington, $49,682. Statement of apportionment of cost for thirty-three-inch outlet, omitting summit: West Orange Township, $64,520; South Orange Village, $62,460; Irvington, $50,880; South Orange Township, $36,100; Millburn, $30,300; Vailsburg, $32,550; Newark, $31,300; total, $308,110, including line to Main-st. at Millburn, $37,300; $30,300 only includes cost to where the Millburn branch joins the western division of the main trunk.

CONTEMPLATED WORK.

Centerville, S. D.—A sewerage system is contemplated.

Columbus, Ga.—The construction of sewers is contemplated.

Tacoma, Wash.—The council has voted to construct certain sewers.

Olyphant, Pa.—Specifications have been adopted for a new sewer.

Lachine, Que.—Plans for a general sewerage system have been adopted.

Elgin, Ill.—A petition is being circulated for a sewer in North-st.

Forrest City, Ark.—Plans are being prepared for sewers and water works.

Winona, Minn.—Plans are being prepared for a sewer in Center-st.

Bridgeton, Pa.—An extension of the sewerage system is contemplated.

Gaylord, Mich.—The construction of a sewerage system is contemplated.

Benton Harbor, Mich.—The city council has ordered a sewer built in Heck Court.

Salina, Kas.—The extension of the sewerage system is proposed. Mayor Roach.

Pekin, Ill.—Petitions are being circulated for South Side sewerage system.

Islip (L. I.), N. Y.—A brick sewer in Main-st. is contemplated. Eugene R. Smith, engr.

Newark, O.—An ordinance is in the city council for constructing a sewer in Pearl-st.

Eau Claire, Wis.—Plans will be prepared for sewers in Second-ave. and Elizabeth-st.

Berwyn, Ill.—The question of building a new outfall sewer is again being agitated.

New Hampton, Ia.—A resolution has been passed to build a sewer in Walnut-ave.

Lewiston, Me.—The construction of a new sewer in Upper Lewiston is proposed.

Anderson, Ind.—The construction of a sewer in Madison-ave. has been proposed.

Indianapolis, Ind.—A resolution was adopted July 10 for a main sewer in Raymond-st.

Malden, Mass.—A trunk sewer, from Malden through Melrose to Wakefield, is contemplated.

Brooklyn, N. Y.—A sewer will be built in Wykoff, Johnson and Knickerbocker-aves.

Nyack, N. Y.—Plans for sewers in South Nyack are being considered by the state board of health.

Roselle, N. J.—An ordinance has been passed for a sewerage system. Township Engr. Woodruff.

Charleston, W. Va.—An ordinance has been passed for an 18-in. tile sewer in Capital-st.

Columbus, O.—The question of issuing $100,000 bonds for building new sewers will be voted on.

Akron, O.—Plans will be prepared for a sewerage system and drainage in districts Nos. 1, 6, 8 and 9.

Port Clinton, O.—A declaratory resolution has been passed providing for a sewer in Jackson-st.

Erie, Pa.—An ordinance was passed July 17 providing for a sewer in McCarter and East-aves.

Jamaica (L. I.), N. Y.—The erection of a sewage disposal plant, at a cost of about $40,000, is contemplated.

Philadelphia, Pa.—Bids will be asked soon for building new sewers and for extending old main sewers.

Augusta, Ga.—Ordinances have been approved for sewers in Jones, Telfair and Walker-sts. C. A. Robbe, mayor.

Greensboro, N. C.—This city has voted to issue $300,000 bonds for improvements, of which $65,000 is for sewers.

South Framingham, Mass.—The question of extending the sewerage system is being considered; estimated cost, $30,000.

Cleveland, O.—Plans for the Doan-st. sewer through Glenville are being prepared by City Engineer Ritchie.

Warsaw, Ind.—Plans are being prepared for sewers and bids will be asked about Aug. 1. J. B. Watson, councilman.

Atlanta, Ga.—Notice of intention has been given for constructing sewers in certain streets. W. D. Green, cy. clerk.

Newark, N. J.—The towns of Millburn, West Orange and Summit have approved the plans for the joint outlet sewer to tidewater.

Brooklyn, N. Y.—The board of public improvements has authorized the extension of the Green-ave. sewer from Patchen to Bushwick.

Merrill, Wis.—This city contemplates the construction of 3,000 ft. of 24-in. crock sewers.

Hamilton, O.—The estimated cost of the proposed sewer in East-ave. is $3,825.05 and for house connections $1,719.50.

Wilkesbarre, Pa.—The council is considering an ordinance providing for the issue of $100,000 bonds for sewer and street improvements.

Darby, Pa.—The borough council has offered the borough of Yeadon $1,000 for the privilege of connecting sewers between the two towns.

Galesburg, Ill.—The city engineer was instructed July 17 to prepare plans for a trunk sewer through Cedar Fork creek. Mayor Carney.

Alton, Ill.—The construction of an 8-in. sewer, with manholes, catchbasins, etc., is desired for Fifteenth and Liberty-sts., in Middletown.

Sioux City, Ia.—City Engineer Lewis has completed a preliminary survey for the proposed Perry creek sewer; estimated cost, $25,000 or $30,000.

La Grange, Ill.—Another effort is being made to unite this city, Grossdale, Riverside and Lyon in a plan to build a joint outlet sewer.

Frankfort, Ind.—A hearing will be given Aug. 8 for the proposed lateral sewer in E. Washington-st., for which an ordinance has been adopted.

Portland, Ore.—A report has been prepared for the proposed 48 and 56-in. pipe sewer for the E. Oak, E. Pine and E. Twentieth-st. sewer dist. Cy. Engr. Chase.

Boone, Ia.—The construction of a sewerage system for the fair grounds addition is contemplated. A sewerage system is proposed for the Fifth ward also.

Duluth, Minn.—The question of building a storm sewer in Eighteenth-ave., west, between Michigan and Superior-sts., has been favorably acted upon.

Summit, N. J.—The common council has decided to vote in September on the question of bonding this city to pay for joining in the proposed trunk line sewer to tidewater.

Methuen, Mass.—The committee has submitted its report for a sewerage system and recommends a system 2 miles long. Alfred Newsholme, D. W. Tenney, J. S. Howe, com.

Tonawanda, N. Y.—The question of constructing a sewerage system in this city in what is known as the Ironton district and in the Gastown district is being agitated.

Clinton, Ia.—A resolution was passed July 11 authorizing City Engineer Chase to prepare plans for sewers in Dist. 1. The sewer will be about ¾ combined and ¼ sanitary, and a pumping station will be necessary.

Bonds for building sewers and sewerage systems have been voted on as follows: Fall River, Mass., sewers, $25,000; Houston, Tex., sewerage system, $300,000; Pottstown, Pa., sewers, $55,000; Houghton, Mich., $60,000.

Marion, O.—The residents of Green Camp and Prospect have protested against this city emptying its sewers into the Little Scioto river, and the construction of a sewage farm is being discussed as the best means of abating the nuisance.

London, Ont., Canada—The sewer committee favors the septic tank system of sewage disposal and proposes that a committee be sent to Mountain Grove and Champaign, Ill., to obtain all necessary information on the subject. Mayor Wilson.

Newark, N. J.—Notice of intention has been published providing for the construction of trunk brick sewers through the Branch Brook park territory, Fourth-st., First-ave. and Lake-st., with branch pipe sewers in a large number of streets. J. Crowell Mundy, genl. supt. wks.

CONTRACTS TO BE LET.

Marion, Ind.—Bids are asked until Aug. 1 for a sewer in Nebraska-st. Cyrus G. Robbins, cy. clk.

Binghamton, N. Y.—Bids are asked until Aug. 1 for a sewer in De Russey-st. S. D. Kane, cy. clk.

Union City, Ind.—Bids are asked until Aug. 7 for building a lateral sewer. G. A. Rosenbush, cy. clk.

Wabash, Ind.—Bids are asked until Aug. 14 for building a local sewer in Indiana-st. Fremont McLees, cy. clk.

Toledo, O.—Bids are asked until Aug. 14 for a cylindrical brick sewer in several streets. Wm. O. Holst, cy. clk.

Buffalo, N. Y.—Bids are asked until Aug. 4 for a 12 to 20-in. sewer in Abbott road. A. G. Parsons, secy. D. P. W.

Lake City, Minn.—Bids are asked until Aug. 1 for a sewerage system, the city to furnish the piping. C. D. Post, mayor.

Collinwood, O.—Bids will be received until Aug. 7 for constructing drains in sewer and drainage dist. No. 1. L. A. Wilson, vil. clk.

East Liverpool, O.—Bids are asked until Aug. 7 for about 500 lin. ft. of 12-in. metal sewer pipe. F. H. Croxall, secy. sewer. comrs.

Chicago, Ill.—Bids are asked until Aug. 7 for constructing intercepting sewers in sections "G" and "H". L. E. McGann, comr. pub. wks.

La Crosse, Wis.—Bids are asked until Aug. 21 for building the Front-st. intercepting sewer. D. E. Bice, chrm. B. P. W. L. W. Gosnell, cy. clk.

Cleveland, O.—Bids are asked until Aug. 10 for building a sewer in Lower-st., bet. Lake-ave. and Detroit-st. John Van Develde, Dept. Dir. pub. wks.

New York City.—Bids are asked until Aug. 2 for sewers in six streets, and for a sewer in Nicholas-ave., borough of Brooklyn. Jas. Kane, comr. sewers.

Kingston, N. Y.—Bids are asked until Aug. 1 for building a sewerage system in the Second and Ninth wards. W. Klingberg, cy. engr.; John T. Cummings, cy. clk.

Kenton, O.—Bids are asked until Aug. 2 for constructing the Scioto river ditch improvement, consisting of a main line, Elder creek lateral and Flat Branch lateral. A. R. Taylor, engr.; Jas. Bastable, co. audt.

CONTRACTS AWARDED.

Princeton, Ill.—The contract for the main sewer was awarded to Chris Awe & Co. of Lincoln.

Larchmont, N. Y.—The contract for sewers was awarded to Michael Deccico for $35,255.

Marshall, Mich.—The contract for 3-mis. of sewers was awarded to Lamson & Crowley for $25,700.

De Pere, Wis.—The contract for a sewer was awarded to J. H. Case of Green Bay for $1,869.30.

Newark, N. J.—The contract for grading and draining West Side Park was awarded to S. C. O'Reilly.

Newark, N. J.—The contract for the Brill-st. sewer was awarded July 20 to James McGuire for $738.

Owensboro, Ky.—The contract for constructing a sewer in Tenth-st. was awarded to Pat Owen.

Rochester, N. Y.—The contract for a sewer in Barton-st. was awarded July 17 to James Kearns for $305.90.

Belvidere, Ill.—The contract for building branch sewers was awarded to Thomas Tole of Rockford for $2,200.

Iron Mountain, Mich.—The contract for a sewer in Madison-st. was awarded July 11 to William H. Sweet for $2,050 82.

Kansas City, Mo.—The Robert J. Boyd Construction company secured the contract for a sewer in Dist. No. 40 for $13,737.

Merrill, Wis.—The contract for building sewers was awarded to Harding & Nelson of Racine for $7,279.50.

Grand Island, Neb.—The contract for sewer extensions was awarded to the Grand Island Plumbing company for $2,500.

Albion, Mich.—John J. Granville of Saginaw secured the contract for the Porter and Clinton-sts. sewer for $785.55.

Cohoes, N. Y.—The contract for constructing certain sewers was awarded to Houlihan & Larkin, city, for $23,350.

Brookfield, Mo.—M. S. Jackson of Cedar Rapids, Ia., secured the contract July 10 for building the sewerage system for $12,479.85.

Portland, Me.—Thomas Shanahan secured the contract July 18 for 1,050 ft. of 12-in. sewer in Congress-st. for $629.

Racine, Wis.—The contract for building a sewer in Forest and Liberty-sts. has been awarded to Peter B. Johnson for $1,508.55.

Findlay, O.—The contract for building a storm sewer at the w. w. pumping station was awarded to Fred Kleinman for $2,942.

Mansfield, O.—The contract for 4,200 ft. of storm water sewers in Main-st. was awarded to the Barber Asphalt Paving company at 35½ cts. a ft.

Avonmore, Pa.—The contract for 2,414 ft. of sewerage, including four manholes, has been awarded to J. F. McIntire for $1,271.14.

Little Falls, N. Y.—The contract for sewers in E. Main and Burrell-sts. was awarded to W. H. Cooninham of Niagara Falls for $10,344.

St. Paul, Minn.—Sewer contracts have been awarded as follows: Minnehaha-st., Andrew Martensen, $2,440; Grand-ave. sewer, G. A. Allen, $257.

Lancaster, Pa.—Sewer contracts have been awarded as follows: N. Ann, Dorwart and Clay-sts. and Harrisburg-ave., J. U. Fritchey; S. Ann-st., F. X. Hinden; N. Mulberry-st., Chas. F. Stauffer.

Nashville, Tenn.—Sewer contracts were awarded July 15 as follows: 15-12-10-in. clay pipe and 36-in. brick sewer, Nashville Plumbing company, $2,898.57; 10-in. clay pipe sewer, Curtis Bros., $375.

New Orleans, La.—The National Contracting company, of New York City, secured contracts for the extention of the drainage system as follows: Contract E, $223,005; contract H, $58,565. Chas. F. Cullon secured the contract F for $620,024 and Rogers & Wright contract G for $24,600.

Newark, N. J.—The board of street and water commissioners received ten plans July 20 for reclaiming medows. The cost of the work ranged from $442,000 to $6,922,000. The various methods proposed are, under the terms of the advertisement, to be submitted to two experts, of whom one is selected by the Pemmis Troners and one by the Board of Trade. If these two cannot decide on a single proposal, a third expert will be called in to make the final determination. The first proposition placed the cost at $2,481,655, and it would require four years in which to complete it; the third placed the cost at $2,725,000, with a yearly expense of $85,000 for the maintenance of the ground; the fourth plan placed the cost at $525,100, with an annual expenditure of $50,000 for maintenance; the fifth plan involved an expenditure of $6,922,000, besides reclaiming the land, which would be worth $25,000,000, thus allowing a gain of more than $18,000,000 to the city; the tenth competition estimated the cost of the work at $442,789.16. In accordance with the advertisement the competitors' names were withheld.

WATER-WORKS.

Sacramento, Cal.—The board of trustees has appointed a Citizens' Water Committee to investigate and report upon the subject of the future water supply.

Philadelphia, Pa.—The examination of the

Delaware and Schuylkill rivers and their tributaries by Messrs. Hering, Gray and Wilson, have led to many sources of pollution of the waters of the Schuylkill.

Somerville, Mass.—According to the report of the board of water commissioners for 1898 the Nashua river water supplied by the Metropolitan Water Board had an oily or fishy taste during the first part of the year, which was caused by a harmless vegetable organism in the water. It is expected, however, that when the new Wachusett reservoir is completed such annoyances will disappear.

Greenfield, Ind.—An ordinance was passed, July 19, reducing the water rates, both to consumers using meters and to those paying by the year. The meter rate is cut from 25 cents per 1,000 to from 10 to 15 cents, according to the amount used, the scale running from 10,000 to 75,000 gallons a quarter. The rates, for domestic purposes, are cut from 10 to 40 per cent. No reduction is made for sprinkling and all factories, hotels, mills, saloons, etc., are required to put in meters.

Newark, N. J.—The water supply has been condemned by the health commissioners, who say that the Pequannock water in its present state is impure and not up to the standard required by the city's contract. Chemical and bacteriological tests of samples of water taken from the Passaic river at the point where the East Jersey company's supply is obtained show that the water is unfit to drink, while tests made of water taken from the new driven wells at Belleville show it to be pure and wholesome. The contract which the East Jersey Water company has with the city provides for the delivery of pure and wholesome water, free from any pollution or contamination. The Water company will await action on the part of the city officials before taking the matter of improvement into consideration.

CONTEMPLATED WORK.

Evanston, Ill.—A new intake and filter may be constructed.

Medicine Hat, Man.—The estimated cost of water works is $39,600.

Norfolk, Va.—Bids are being asked for pumping machinery. Norfolk Water company.

Jacksonville, Ill.—The construction of a filtration plant is recommended.

Davenport, Ia.—Water mains have been recommended for a number of streets.

Aberdeen, Miss.—Plans are desired for a water works system. J. M. Acker, mayor.

Zanesville, O.—The citizens are unanimous in their demand for a filtration plant.

Doylestown, Pa.—The town council is considering means of storing the water supply.

Ballston Spa, N. Y.—Bids will be asked soon for building water works. H. E. Green, mayor.

Oakland, Cal.—The construction of a new reservoir for the city water works is contemplated.

Greensboro, N. C.—This town has voted to issue $300,000 bonds, of which $10,000 will be for water works.

Albany, N. Y.—Bids will be asked by the water board for the laying of 20-in. water mains. Supt. Bailey.

Sangerville, Me.—The question of increasing the water supply is under consideration.

Des Moines, Ia.—The water committee has recommended that water mains be laid in a number of streets.

Minneapolis, Minn.—The water works committee will probably purchase a new outlet pipe for the reservoir.

Dixon, Ill.—About 9,103 ft. of water mains, with seventeen hydrants, 14 water gates, will be laid.

San Marcos, Tex.—Wm. Green desires estimates on a 1,000,000-gal. pump for the water works.

Mt. Morris, N. Y.—The proposition to build a steel dam across Genesee river was favorably voted on July 8.

Copenhagen, N. Y.—The estimated cost of the proposed water works system is $38,000, including the reservoir.

Bingham Canyon, Utah—A committee has been appointed to secure plans for a water works system. F. W. Quinn, secy.

Bucyrus, O.—Bids will be advertised soon for the construction of a new reservoir with a capacity of 60,000,000 gals.

New Richmond, Ind.—Dr. Detchon and O. W. Mason have been appointed a committee to investigate the subject of water works.

Barre, Vt.—A resolution has been passed authorizing the city engineer to extend the water system at Houghton's Mill, in Orange.

The question of issuing bonds has been favorably voted on at Wenatchee, Wash.; Elmore, Minn.; Renfrew, Ont.; South Brooklyn, O.

Columbus, O.—The question of a better water supply at Columbus barracks is being considered by the officers at Washington, D. C.

Atlantic City, N. J.—The council is considering an ordinance providing for a new water main across the meadows; estimated cost, $108,000.

Sandusky, O.—The question of purchasing a new pumping engine at a cost of $20,000 is being considered. Councilmen Center and Hoffman.

Highland Park, Ill.—The city water commission has recommended that the city build sand-bed filters to purify the lake water furnished by the city water works.

The question of issuing bonds for water works will be voted on at the following places: Woodstock, Va.; Elyria, O.; Elberton, Ga., Aug. 10; Bellevue, Pa., Aug. 3.

Rock Island, Ill.—A report has been submitted by Engineers Mead, Fanning and Benzenberg relating to the reservoir. The estimated cost of the repairs and change is $44,173.

Poughkeepsie, N. Y. — The Southern Duchess Water company contemplates building a dam to impound 90,000,000 gals. of water for a supply at the Insane Asylum, Matteawan and the village of Fishkill.

Newark, N. J.—The board of street and water commissioners is considering what action to take to compel the East Jersey Water company to open and deliver water from Canistear reservoir into Oak Ridge reservoir.

Pratt City, Ala.—(Special.)—This town has engaged Alber & Byrne of Birmingham to prepare plans and specifications for a water works system and to superintend the construction of the same. Bids will be called at once. E. J. Hudnall, mayor.

The construction of water works is contemplated at the following places: Leslie, Mich.; Coldwater, Mich.; Woodstock, Va.; Newport, Ark.; McKinley, Minn.; Phoenix, Ariz.; Grand Meadow, Minn.; Jennings, La.; New Boston, O.; Yorktown, O.; Newman, Ill.; Clarinda, Ia.; Morrillton, Ark.

Elberton, Ga.—(Special.)—This town has engaged Alber & Byrne, civil engineers of Birmingham, to prepare plans and superintend the construction of a water works system. The city has commenced work on the plant and has called an election to be held on the 10th of August to vote a bond issue of $25,000 to complete the works.

CONTRACTS TO BE LET.

Forrest City, Ark.—Bids are asked until Aug. 7 for water works and sewers. S. H. Mann, cy. clk.

Red Lodge, Mont.—Bids are asked until Aug. 3 for a water works system. William Larkin, mayor; George H. Bailey, clk.

Grand Junction, Col.—Bids are asked until Aug. 8 for a water works system. M. O. Delaplain, cy. clk.

Vernon, B. C.—Bids are asked until Aug. 14 for laying pipes for the water works. Frank McGowen, cy. clk.

Cullman, Ala.—Bids are asked until Aug. 14 for a water works system. John F. Beyer, mayor; R. I. Burke, clk.

Hillsboro, Ill.—Bids are asked until Aug. 1 for a brick water tower and steel tank thereon. James A. Short, water comr.

Chicago, Ill.—Bids are asked until Aug. 2 for laying water service pipes in sixteen streets. L. E. McGann, prest. bd. local imp.

Braddock, Pa.—Bids are asked until Aug. 7 for one 5,000,000 gal. compound condensing duplex pumping engine. William Howat, supt. pub. wks.

Lakewood, O.—Bids are asked until Aug. 7 for laying a 6-in. water main in Coutant-st. John French, clk. bd. trustees.

Lincoln, Neb.—Bids, accompanied with working drawings, are asked until Aug. 7 for a 50,000,000 gal. tower. G. H. Ellsworth, supt. const. University of Nebraska.

Rome, N. Y.—Bids are asked until Aug. 2 for excavation and back-filling of water pipe trenches and laying about 10,000 lin. ft. of 6, 8, 18-in. cast iron water pipe, with valves, etc. Charles T. Hayden, clk. bd. water and sewer comrs.

CONTRACTS AWARDED.

Watertown, Conn.—The contract for building the water works has been awarded to Loring N. Farnham.

Danbury, Ia.—The contract for a water works system was awarded to John Ward of Audubon for $5,321.

Webster, Mass.—Geo. F. Blake & Co. of Boston secured the contract for a new pump at the pumping station.

Superior, Wis.—The contract for a sand filter of 5,000,000 gal. capacity was awarded to Geo. J. Grant of St. Paul.

Michigan City, Ind.—The contract for an intake system of water works was awarded to James Mann of Dowagiac, Mich., for $37,000.

Belgrade, Minn.—The contract for water works and electric lights was awarded to Fairbanks, Morse & Co. of St. Paul for $7,500.

Lewiston, Me.—The contract for putting in the Lake Auburn conduit for the Lewiston water works was awarded to Pearse & Clifford for $72,516.10.

Syracuse, N. Y.—The contract for laying about 6 mls. of water mains was awarded, July 10, to the Camden Iron Works at $25.40 a ton for 4, 6, 8-in. pipe; $24.40 for 10, 12, 16-in. pipe; 2¼ cts. a pound for special castings.

BRIDGES.

Glendive, Mont.—This county has voted to build a bridge.

Elkton, Md.—Bids are asked until Aug. 1 for three bridges.

Duluth, Minn.—Bids are asked until Aug. 10 for a steel bridge over Coffee creek.

Saginaw, Mich.—Plans are being made for a new bridge at Genesse-ave. Cy. Engr. Terry.

Sullivan, Ind.—Bids are asked until Aug. 7 for four steel bridges. J. R. Riggs, co. audt.

Mansfield, O.—A new iron bridge over Rocky run, on the Shelby road, is contemplated.

Glendive, Mont.—Bids are asked until Aug. 15 for a new steel bridge over Yellowstone river. Co. comrs.

Urbana, Ill.—Bids are asked until Aug. 1 for two steel beam bridges. Ira O. Baker, Champaign, Ill.

Vevay, Ind.—Bids are asked until Aug. 7 for extending an arch culvert. Jos. E. Hart, co. audt.

Glen Mills, Pa.—A petition has ben presented to the commissioners for a bridge over Chester creek.

Sault Ste. Marie, Mich.—Bids will be desired soon for five or six bridges. Jas. H. Lawrie, cy. engr.

Battle Creek, Mich.—The common council decided, July 10, to build an iron or stone bridge on S. Jefferson-st.

Council Grove, Kas.—Bids are asked until Aug. 14 for an iron bridge over Laird's creek. F. H. Hannah, co. surv.

Meridian, Miss.—Bids are asked until Aug. 7 for a bridge across Brown's creek. B. V. White, clk. bd. co. suprs.

Cannelton, Ind.—Bids are asked until Aug. 8 for a highway bridge on Deer creek. John Scull, co. comr.

Goldendale, Wash.—Bids are asked until Aug. 8 for a bridge across the creek known as the outlet to Camas lake. Co. comrs.

Freeport, Ill.—The Wrought Iron Bridge company of Canton, O., secured contracts for three bridges in Harlem twp. for $1,400.

Des Moines, Ia.—The council has ordered the city engineer to prepare plans for a steel bridge across the river at Sixth-ave.

Rome, N. Y.—The city engineer has been instructed to prepare plans and specifications for a bridge between this city and Verona.

Okarche, Okla.—The county commissioners have decided to build a bridge across the Cottonwood, 16 miles east of this place.

Albion, Mich.—The Wrought Iron Bridge company, Canton, O., was awarded the contract July 7 for the new Clinton-st. bridge for $1,825.

Oakland, Cal.—Bids are asked until Aug. 9 for a steel highway bridge across tidal canal at Oakland harbor. W. H. Heuer, San Francisco, Cal.

Cincinnati, O.—Bids are asked until Aug. 19 for bridges and approaches thereto over the south fork of Taylor's creek. E. L. Lewis, co. audt.

Roseburg, Ore.—Bids are asked until Sept. 6 for a bridge across Looking Glass creek at Brookway and one across Elk creek at Drain. Joe Lyons, co. judge.

Milwaukee, Wis.—An ordinance has been introduced authorizing the issue of bonds for the proposed Grand-ave. bridge and one across the Milwaukee at Broadway.

Decatur, Ill.—The Wrought Iron Bridge company, Canton, O., secured the contract for a 124-ft. span and sundry repairs on other spans of the Wycoff bridge for $4,396.

Chicago, Ill.—Bids are asked until Sept. 20 for the superstructure of the tow path bridge on the line of the Illinois and Michigan canal at Joliet. William Boldenweck, prest. bd. trustees.

Terre Haute, Ind.—Bids are asked until Aug. 10 for a steel or brick viaduct over the waterway overflow of the Wabash river, on the National road, between this city and West Terre Haute. Jas. Soules, co. audt.

Defiance, O.—Bids are asked until Aug. 7 for building two stone abutments for a bridge over a stream near the Hartshorn farm, in Washington twp. W. A. Snyder, co. audt.

Boonville, Ind.—The county commissioners have ordered bridges built across Pigeon creek, at Brandford; across Barrenfork, in Owen twp.; across Squaw creek, in Ohio twp.

Greenfield, Ind.—Bids are asked until Aug. for building a bridge across a large branch or ditch near McCordsville, in Vernon twp., and for the repair of the iron bridge across Blue river, in Blue River twp. John Manche, chrmn. co. comrs.

Indianapolis, Ind.—The city council passed an ordinance July 14 appropriating $150,000 for bridges and authorizing a 3½ per cent. loan to that amount. The bridges will probably be built as follows: Meridian-st., stone Melan arch, $40,000; Indiana-ave., steel, $20,-

000; Illinois, girder, $20,000; Washington, steel, $40,000; Pogue's run, Pine-st., steel, $4,000; Pogue's run, Market-st., $6,000; canal, Washington-st., wood, $1,000.

Muncie, Ind.—The Heekin park land company has donated a park and $5,000 in cash to this city.

Denver, Col.—Elaborate park improvements are contemplated by the park commissioners.

Newark, N. J.—This city has given to the county park commissioners two plots of land adjoining Branch Brook park.

STREET LIGHTING.

Bellaire, O.—Bids will be asked until Aug. 22 for lighting the city. Cy. coun.

Evansville, Ind.—Bids are asked until Aug. 12 for lighting the city for five years. B. P. W.

Mullica Hill, N. J.—The question of putting in a lighting plant will probably be voted on.

Jackson, Miss.—Bids are asked until Aug. 5 for an electric light plant. F. B. Faber, vil. rec.

Blissfield, Mich.—Plans and specifications are being made for an electric light plant. Fred K. Wilber, clk.

Greensboro, N. C.—This town has voted to issue $300,000 bonds, of which $25,000 if for electric lights.

Vermont, Ill.—Bids are asked until Aug. 8 for constructing an electric light plant. C. S. Alexander, chrmn.

Atlanta, Ga.—Plans for a municipal electric light plant are being made by Nisbet Wingfield, comr. of pub. wks.

Coffeyville, Kas.—Bids are asked until Aug. 1 for a municipal electric light plant. E. E. Nielson, chrmn. elect. light com.

Plymouth, Ind.—Bids are asked until Aug. 14 for lighting this city with electricity for five or ten years. F. W. Boss, clk.

Plymouth, Ind.—Bids will be received until Aug. 14 for lighting this city with electric lights. Com. on elec. lgts. R. B. Oglesbee, cy. atty.

Milwaukee, Wis.—A resolution, calling for drafting of an ordinance to acquire a street lighting plant, has been introduced in the common council.

Warm Springs, Ark.—Bids are asked until Aug. 7 for an electric light plant for the Warm Springs Indian Agency. W. A. Jones, Comr. Indian Affairs.

Charleston, Ill.—Bids are asked until Aug. 1 for an electric light plant for lighting the city and furnishing lights to private persons. Will J. Kenny.

MISCELLANEOUS.

St. Augustine, Fla.—Bids are asked until Aug. 7 for delivering about 60,000 tons of stone in place of jetties at the mouth of St. John's River, Fla. Capt. C. H. McKinstry, U. S. Engrs.

Philadelphia, Pa.—Bids will be received until Aug. 12 for covering with asphalt the concrete platform, steps and roof of new battery at Ft. Delaware, Del. C. W. Haymond, Lieut. Col. Engrs.

Cincinnati, O.—Bids are asked until Aug. 12 for furnishing at dam No. 6, Ohio river, 18,000 bbls. of natural hydraulic cement. Wm. Davis, resident engr., Davis Island Dam, Bellevue, Pa. W. H. Bixby, Maj. Engrs., Custom House, Cincinnati.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

South Bend, Ind.—The purchase of a street sprinkler is contemplated.

St. Louis, Mo.—An appropriation of $90,000 has been made for street cleaning.

Paterson, N. J.—The question of building a garbage disposal plant is being considered.

Chattancoga, Tenn.—City Engineer Cook has been authorized to purchase a new street sweeper.

Hazelton, Pa.—An ordinance has been passed providing for the collection, removal and disposal of garbage.

Topeka, Kas.—S. C. Thompson of Kansas City, Mo., proposed to build a garbage crematory in this city.

Albany, N. Y.—The board of health is in favor of a reduction plant. Dr. F. C. Curtis and T. B. Baily, health officers.

Oakland, Cal.—Estimates and plans for a salt water sprinkling plant, to cost about $50,000 have been submitted by Street Superintendent Miller.

Washington, D. C.—The district commissioners desire suggestions for the disposal of the garbage and waste of the city, according to press reports. The present contract expires July 1, 1900.

TOO LATE FOR CLASSIFICATION.

Medina, N. Y.—This city's water works plant will be sold by Receiver Sturgis.

Philadelphia, Pa.—Bids are asked until Aug. 3 for the new main sewers. Dir. Pub. Wks. Haddock.

McKenzie, Tenn.—The formation of a home water company, to build water works, is suggested.

Lockland, O.—The engineer has been instructed to prepare estimates for improving Carthage-ave.

Rushville, Ill.—The question of brick paving is under consideration. Mayor Hartman; Cy. Engr. Bagby.

Bay City, Mich.—The contract for a 5,000,000 gallon pump was awarded, July 20, to the Holly Mfg. Co.

Grand Rapids, Mich.—A resolution has been prepared for a 60-ft. bridge across the Grand river at Bridge-st.

Oldtown, Me.—The contract for constructing the sewerage system was awarded to A. J. Keith, for $3,700.

Richmond, Mo.—The plans for filtering the hydrant water have been returned to the engineers for revision.

Ashland, O.—F. Herbert Snow, of Boston, has advised the biological process of sewage disposal for this city.

Fond du Lac, Wis.—Bids will be received until Aug. 7 for building a sewer in Third-st., from Center to Harney. F. A. Bartlett, cy. clk.

Harrisburg, Pa.—The contract for repairs on the asphalt streets for ten years was awarded to the Barber Asphalt Co., at $4,950 a year.

Conneaut, O.—The board of health has decided that the sanitary condition of W. Main-st. demands the extension of the State-st. sewer to the Whitney road.

Charleston, W. Va.—(Special.)—Bids will be received until Aug. 10 for about 16,688 sq. yds. of brick paving. Information can be furnished on application to W. A. Hogue, cy. engr.

Washington, Ia.—Bids were received July 20 for building a sewer, from Wm. Horrabin, of Iowa City, R. C. Delahunt, of Cedar Rapids, and Webster & Blake, of Dubuque. The bids were higher than the council anticipated, and the contracts have not yet been awarded.

Toledo, O.—Mayor Jones recently bid $300,000 for the sale or lease of the Toledo gas plant, but because his bid did not specify the price at which gas was to be sold the committee rejected it and voted to accept that of J. N. Bick, at $256,000. Mayor Jones stated to the council that he could find a better bidder than that and that he could sell the plant for a half million dollars. A motion was made, July 24, to reject all bids and advertise again.